

August 21, 1961

Aviation Week and Space Technology

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Antenna Arrays
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ANOTHER ASPECT OF THE MARQUARDT MISSION

ELECTRIC PROPULSION

Sustained space travel, free from gravitational influence, presents new and difficult problems in the propulsion and control of space vehicles. Electric propulsion promises a practical and economical means of accomplishing space exploration programs.

The three main types of electric engines, while serving important applications, share common advantages over chemical rockets. The electrochemical, electromechanical, and electrostatic engines offer specific impulse greater than 1,000 seconds and thrust densities measured in watts to watts. As a result, electric propulsion systems have the capacity to deliver much larger payloads over longer distances than will conventional rockets. Power for these electric engines can be drawn either from nuclear energy sources built into the vehicle or from solar radiation.

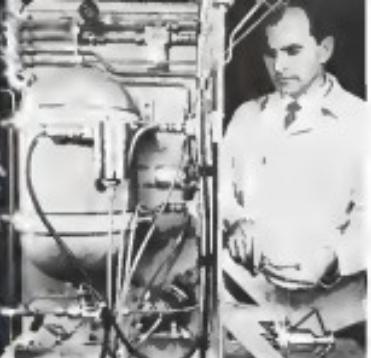
The Marquardt Corporation — long a leader in the field of propulsion — is interestedly engaged in a variety of unique electric propulsion projects. An example is the electro-thermed area in the Marquardt Blue Star hydrogen propellant system, where an electrically heated resistance element prior to

expansion in a deion nozzle. The Marquardt provides reliability, long life, direct coupling to the power supply, high efficiency, a simple starting cycle, and low-temperature.

The Marquardt Corporation's efforts in the space propulsion and control fields serve to typify yet another aspect of the Marquardt Mission.

Creative engineers and astronauts are needed. All qualified applicants will receive consideration regardless of race, creed, color, or national origin.

THE Marquardt
CORPORATION
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Special test facilities developed by Vickers Research and Development teams are used to evaluate nozzle designs, fuels, controls, instrumentation, etc. This setup is used in hypersonic hypopulsion studies.



Nozzle designed for hypersonic hypopulsion shown under test. Burn temperature 3500°K. Exhaust flame is characterized by well defined series of shock diamonds.

AERO HYDRAULICS DIVISION
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SPERRY RAND CORPORATION

PROGRAMMED POWER IN
POWER TRANSMISSION
ENERGY CONVERSION
FLUID TRANSFER

Space vehicle attitude control unit developed by Vickers weighs 2 tons, yet can be set in motion with a finger touch. Entire unit is supported on a 3.3 inch steel ball that floats on a hydrodynamic bearing and is free to move in three planes - pitch, yaw and roll.

CAPABILITY
is spelled
a-t-t-i-t-u-d-e
c-o-n-t-r-o-l

Selection of the optimum attitude control system for a particular missile or space vehicle requires special technical skills, facilities for conducting the necessary test programs, and knowledge usually based on related experience. All these are available "in quantity" at Vickers.

Actual experience dates back to hot gas servo studies initiated in 1955 and now covers the additional areas of hydrazine pressurized-powder reaction control, hypersonic hypopulsion, and secondary injection systems using either liquid (liquid), or hot gas feed from engine combustion chambers.

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Longer Life for Engines



Oil seals, diaphragms, and many other automotive parts are fabricated by heat-treating Silastic. Silastic physical properties are essentially retained in temperatures from -120 to 500°F., resist oxidation, weathering, moisture and compression set. Silastic stays rubbery under the most adverse operating conditions — provides a combination of properties that — plus the encapsulation of this "inert" material to meet rigid performance requirements.

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Grommets of Silastic Withstand 350F; Effectively Seal Coolants

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A factor in the performance of their engines is a set of 20 cylinder-head grommets made of Silastic®. The Dow Corning silicon rubber. The grommets proved so effective in Cummins' new engines, they are now specified as standard components on other models throughout the Cummins line. These resilient silicon rubber rings are positioned over the entrances to coolant passages in the top of the block. They prevent leakage of coolant and waterfrosts into the engine and the costly damage that could result. The grommets snap into the cylinder head gasket where they remain flexible and serve sealing, despite attack by cooling fluids and engine temperatures in the 360 to 150°F range.

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Bow Group Corporation

BRIDGELAND BRIDGE BUILDERS

AVIATION CALENDAR

- Aug. 23-26 Biannual Aerospace Agency's Second High Energy Plasma Meeting, Holman Field, Thomasville, Fla., Paul Mire.

Aug. 25 26-West Coast Conference of Applied Mechanics, University of Washington, Seattle, Wash.

Aug. 26-28 The Fourteenth Aerospace Corp. Symposium on Advances in Models and Aerospace Technology, University of Southern California, Los Angeles, Calif.

Aug. 28-Sept. 1-Third International Hot Topics Conference, University of Colorado, Boulder, Colo.

Aug. 28-Sept. 1-Twelfth International Symposium on Aerobatics and Aerostatics, Aerospace Institute, Rocket Society, Tokyo, Japan.

Aug. 28 Sept. 1-10th Annual Meeting of the American Association for the Advancement of Electronics Control, Cornell University, Ithaca, N.Y.

Aug. 28-Sept. 1-Third Annual Seminars on Space and Earth Sciences, Institute of Viscous Aerodynamics and Propulsion Engineering, Arzamas-16, Moscow, Russia.

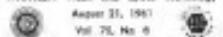
Sept. 4-7 1981 Flying Displays and Exhibitions, Society of British Aircraft Constructors, Farnborough, England.

Sept. 4-7 1981 English/American Aerospace Congress, Royal Aeronautical Society, London, England. William Wright Memorial Lecture, Sept. 7.

Sept. 4-7 1981 National Conference on Applications of Microprocessors in Industrial Data Processing, Educate Stat 90, Billings, Mont., Billings, Mont.

(Continued on page 6)

AQUATIC SYSTEMS AND DESIGN TECHNOLOGY



and now will be submitted for adoption by the Board of Education.

Geological Society of America Special Paper 133, 1937, pp. 1-100, 1 plate.

Revolving-Plane and Polar-Plane Methods for Determining the

ESTATE PLANNING AND FINANCIAL INDEPENDENCE

**MULTIPLE BANDWIDTH
TELEMETRY RECEIVER
NEMS-CLARKE 1455**



 [View additional reporting and analysis of secondary job market trends by the Center for Economic Studies](#)

The ease and speed of changes in IF bandwidth, and interchangeability of modules, makes this receiver the most versatile of Morris-Clarke's 1400 series telemetry receivers.

This receiver is unique because it offers a variety of plug-in IF-demodulator modules which plug into front panel to determine operating IF bandwidth of receiver. Each module is interchangeable with the others without disturbing the level adjustments of receiver, since each module provides output voltages and meter deflections of essentially the same percentage of bandwidth. Thus, the basic receiver chassis serves to cover bandwidth ranges from 30 kHz to 1.5 MHz in nine separate bandwidths.

Pre-Detection Features—In addition to the usual standard outputs for connection to auxiliary equipments (such as signal strength, voice frequency response, frequency monitor and spectrum analyzer), this receiver has a 5 ms pre-detection recording output and converter input. When the output is connected to a Pre-Detection Converter, Name-Clarke Type FIC-1400, and a recorder, telemetry data can be recorded prior to demodulation and stored for subsequent playback and demodulation.

Modules for the receiver may be obtainable separately as required in the following IF bandwidths: 30, 50, 100, 200, 300, 500, 750 & 1000 cps.

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Gas → Nitrogen, Hydrogen, Oxygen and Helium

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(systems)

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Actuators and Reservoirs
Satellite Orientation and Maneuvering → Reaction Jet System
Mobile Acceleration and Rate Control → Proportional Thrust Motors
Aerodynamics → Nose and Dihedral
Thrust Vectoring → Pitch, Yawing and
Banking Impulses
Thrust Range → 0.01 lbs. to 400 lbs.
Temperature Range (Fixed) → -10° to +1000°F
Response Range → 4 microseconds to 30 milliseconds
Total Thrust → 10 lbs. max. to 100,000 lbs. min.
Pressure Range → 3 psi to 7000 psi
Reaction and Commanded
Temperature (Dimensions Same) → -10° to +1000°F
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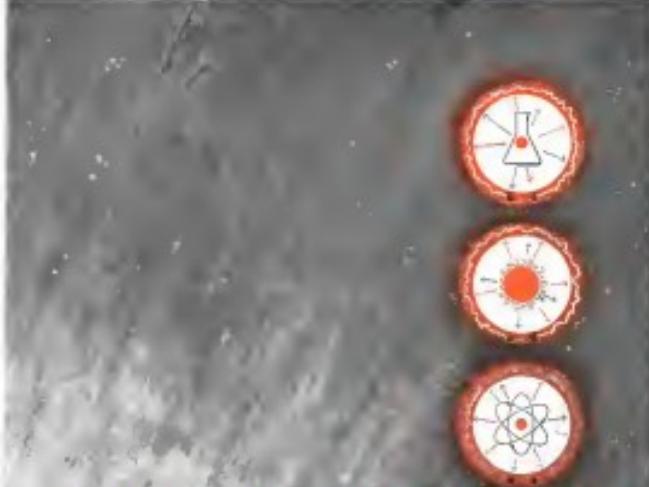
Kidde Aero-Space Division

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Walter Kidde Company of Canada Ltd., Montreal, Quebec, Canada

AVIATION CALENDAR

(Continued from page 5)

- Sept. 5-6—Fourth Annual Scientific Meeting Flying Physicians Assn., Duluth Hotel, Rose City, Mich.
- Sept. 6—National Symposium on Space Electronics and Telecommunications of Radio Engineers, University of New Mexico, Albuquerque, N.M.
- Sept. 10-11—Joint Nuclear Instrumentation Symposium, North Carolina State College, Raleigh, N.C. Sponsored American Institute of Electrical Engineers, International Society of Acoustics, IEEE.
- Sept. 11-12—Meeting, West Point Research & Development Institute, University of California, Berkeley, Calif.
- Sept. 11-12—National Convention, National Astronomical Assn., Weatherly, N.Y.
- Sept. 13-14—International Operations and Maintenance Symposium, Arcoirk Corp., Newark, N.J.
- Sept. 13-14—16th Annual Meeting, Armed Forces Chemical Assn., Sheraton Hotel, Washington, D.C.
- Sept. 14-16—Ninth Annual Joint Services Engineering and Management Conference, IBM, Holley Research, New York.
- Sept. 14-15—International Technical Conference on Communications, Institute of Space Exploration, Bell Telephone Laboratories, Philadelphia, Pa.
- Sept. 17-18—Annual Convention, National Assn. of State Aviation Officers, Miami Beach, Fla.
- Sept. 23-24—Federal Electronics Resources, Institute of Radio Engineers, Standardized Test Bed, Radio Man.
- Sept. 26-28—National Classification and Aerospace Processes, Air Force Assn., Philadelphia, Pa.
- Sept. 26-27—Annual Convention, National Aerospace and Defense Assn., Mayflower Hotel, Wash., D.C.
- Sept. 29-30—Society of Experimental Test Pilots 13th Annual Symposium and Awards Banquet, Beverly Hilton Hotel, Beverly Hills, Calif.
- Oct. 1-2—Sixth Annual Communication Symposium, Institute of Radio Engineers, Hotel Union, New York.
- Oct. 17-18—International Astronautical Congress, Washington, D.C.
- Oct. 18—National Airport Conference, University of Oklahoma, Norman, Okla.
- Oct. 21-22—National Aerospace Engineering & Manufacturing Meeting, Society of Automotive Engineers, Anaheim Hotel, Los Angeles, Calif.
- Oct. 9-10—Atlas Rocket Society's 16th Annual Meeting & Space Flight Review, Hotel Americana, New York, N.Y.
- Oct. 14-15—International Astronautics Federation 1981 General Conference, Hotel Quaranta, San Jose, Costa Rica.
- Oct. 15-16—National Aviation Safety Committee, National Safety Council, Conrad Hotel, Chicago, Ill.
- Oct. 25-26—Meeting, Canadian Astronautical Institute/Academy of the Americas, Toronto, Ontario, Canada.
- Oct. 25-27-28—Annual General Meeting, International Air Transport Assn., Sydney, Australia.
- Oct. 26-28—International Symposium on Advanced Nuclear Propulsion, Institute of Space Engineers, Radnor Hotel, Las Vegas, Nev.



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A CREATIVE TEAM OF SCIENTIFIC ENGINEERING AND PRODUCTION TALENT

Foundation news from Johns-Manville



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THE INSULATION WITH A LOWER CONDUCTIVITY THAN STILL AIR IS NOW AVAILABLE IN BLANKET AND TAPE FORMS FOR UNLIMITED NEW APPLICATIONS

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1950

FIRST successful intercept of piston aircraft by guided missile... Raytheon's Lark.



1956

FIRST successful intercept of jet aircraft by guided missile... Raytheon's Hawk.



1960

FIRST successful missile-to-missile intercept... Raytheon's Hawk.



Artist's conception of the ballistic missile challenge

Raytheon brings proven capability to the

Defense against ballistic missiles is one of today's most challenging technological problems. Raytheon, since its development of Lark in 1950, and its participation in 1954 in the Wimber studies, has been working on a broad technological front in the development of systems concepts and equipments for de-

fense against missiles and aircraft.

The development and production by Raytheon, as prime contractor, of the U.S. Army and Marine Corps Hawk, and the U.S. Navy's Sparrow III missile systems, are part of this broad spectrum of defense system capability. Allied programs include study of

challenge of ballistic missile defense

Field Army Ballistic Missile Defense, development of the PINCUSHION and COBAR Advanced Radar Systems, and responsibility as Systems Manager for the ARPAT Missile Defense Research Program.

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are a few of the multiple applications for which the Flex Wing can be used.

Based on a National Aeronautics and Space Administration concept, the Flex Wing provides greater lift per weight than fixed wings, it resists inherent stability and can be power-controlled in both powered and unpowered versions. It can be packaged into an extremely small volume and then deployed faster than any other deployment or lifting device.



The Flex Wing aircraft developed by the Ryan Aerospace Corporation.

Ryan has received several contracts from NASA and the military services to explore and develop the more promising Flex Wing applications. Pioneering an entirely new concept, such as Flex Wing, is typical of Ryan's Space Age capabilities.

Ryan Aerospace—Ryan Aerostatic Company, San Diego, California.

RYAN

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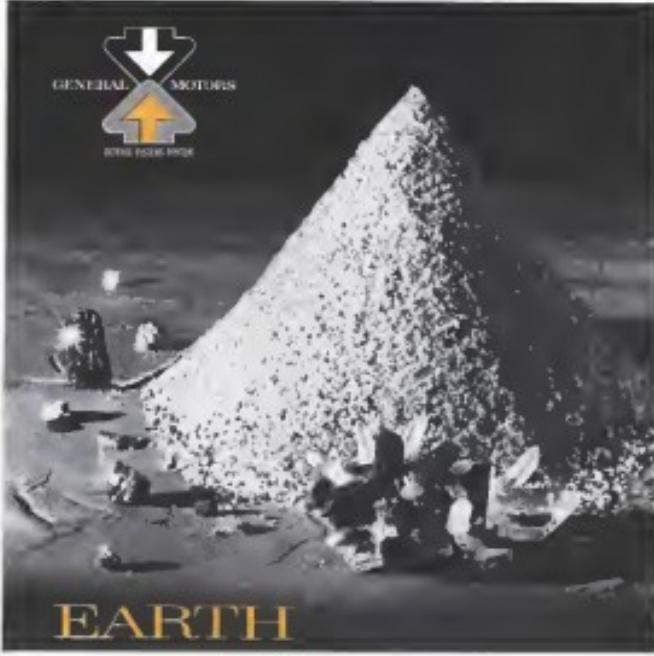
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SPACO The Radar Products Engineering Division of Kelsey Hayes is developing the radar antenna mounts for Bell Aerospace's All-Weather Automatic Landing System. Designated AN SPN-13 by the Navy, the system has been selected for use aboard the U.S.S. Enterprise and other nuclear-powered carriers.



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Aviation Week ... Space Technology

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The NASA-AT&T Contract

National Aeronautics and Space Administration has signed a highly unusual agreement with the American Telephone & Telegraph Co. for the launching of experimental communications satellites. Because of the great interest that has accrued in government and in the communications and aerospace industries, Assistant White is publishing the statement made recently by NASA Administrator James E. Webb before the House Science and Astronautics Committee, which is the most complete explanation of the philosophy behind the contract that has been given by the government to date:

When I appeared before this committee earlier to discuss the work of the National Aeronautics and Space Administration in the field of communication satellites, we had not at the time concluded a cooperative agreement with American Telephone & Telegraph Co. We have now done so, and I am therefore able to discuss that agreement with you.

The American Telephone & Telegraph Co. will design and build communication satellites, at its own expense, for two launches during 1967. NASA will provide the launch vehicles and the services for launch, tracking and tracking and will be reimbursed by AT&T.

These agreements with AT&T will aid greatly to the total program of experimentation in active satellite communications and will assist in the development of relationships between government and industry which are necessary to accelerate the early realization of an operational system.

The agreement with AT&T has been made as a manner which will avoid putting AT&T in a preferential position in relation to other interested companies, which may, in the future, have an interest in the operation of a communications satellite system or supplying equipment to the operator of such a system.

In the first place, the project is recognized by both parties as entirely experimental. This means that it does not involve any commitment with respect to any operational scheduling or any particular design of operational satellites.

Secondly, a full report of the experimental results achieved by AT&T will be made to NASA and thereby the government will be in a position to apply the results obtained for the benefit of any authorized commercial undertaking pursuant to future action by the Federal Communications Commission.

In the third place, we have made very specific arrangements concerning patentable inventions. There may be joint ventures in the course of the "work performed under or in anticipation of this agreement." As to these, the government will have a royalty-free license for the practice of such inventions throughout the world by or on behalf of the United States government in any foreign government pursuant to treaty or agreement.

Also in these inventions, the government will have

the right to grant licenses to others for the practice of such inventions throughout the world for any purpose whatsoever upon such terms and conditions as the administration may prescribe. The government's right to grant licenses is unencumbered as to both the parties to be benefited and the purposes for which such inventions may be practiced.

So far I have referred to inventions that might be directly determined to be made under or in anticipation of the cooperative agreement. In addition, however, NASA and AT&T have agreed that certain rights are to be acquired by the government with respect to any invention made in the result of AT&T sponsored research during the period beginning on May 18 of this year and running through in one year after the last launch.

"AT&T sponsored research" includes any project which "has as one of its purposes advancement of the state of the art in communication satellite systems, equipment components, or ground tracking, transmitting or receiving facilities therefor." Now, as to any such invention made during the period by AT&T, the government will obtain a royalty-free license to practice the invention throughout the world by or on behalf of the United States government.

In addition, we have specifically agreed that the subcontractor shall have the right, in connection with the operation of a communication satellite system or the production of components for a system, to "grant licenses to business entities domiciled in the United States, under such terms and conditions as the subcontractor may prescribe for the practice of such inventions throughout the world."

The significance of the patent provisions agreed to by NASA and AT&T is that whatever form of exploitation may be determined to be in the public interest and approved by the Federal Communications Commission for providing communication services to the public through satellite relay, that organization will be able to use inventions made by AT&T while in this cooperative relationship with NASA.

As you are aware, the President has stated, and the Federal Communications Commission has endorsed that one of the principles which should govern the operation of a communication satellite system is that there be competition in the production of equipment for the satellite system. Our purpose in negotiating the patent arrangements, which I have described, with AT&T is to be able to assure the free availability of any resulting inventions in the public interest.

The AT&T agreement, in my judgment, is a forward step in the development of cooperative relationships between government and industry to attain an important objective in the practical application of space technology.



BFG FUEL CELLS FIT T-38 LIKE A GLOVE TO INCREASE RANGE

To maximize the capacity of the five internal fuel cells of the Northrop T-38, every bit of available space has to be utilized. Thus B.F. Goodrich builds the cells in a compact configuration—easier down the road for refueling—so to avoid structural anomalies and reduce weight.

These BFG cells are produced in very close tolerances to provide a fail-safe system with proper fit. The close quality control was dictated by Sturtevant's unique flight operations. And as an added bonus, the compact design fits in which reduces the total fuel weight.

B.F. Goodrich engineers complete fuel cell test and development facilities...and has extensive experience in design and production of cells for aircraft, missiles, and ground vehicles. For complete information contact B.F. Goodrich Aerospace and Defense Products—a division of The B.F. Goodrich Company, Dept. AW 9B, Akron, Ohio.



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Washington Roundup

Research Warning

Defense Department's Office of Research and Engineering, which was warned recently in congressional hearings to give defense research the same kind of flexibility and stock options now that the President is trying to do in the military services, has added another important directorship. Arthur W. Robinson, Jr., who has been manager of space business for General Electric Co., will handle international programs.

Sen. Jacob Javits told Dr. Harold Brown, director of the office, that "the military research program needs 'flexibility availability,' and that it cannot not be like 'a primitive society' that cannot move around because it is so big, so巍峨. You have got to move fast." Brown, who agrees, said the package program approach to budgeting will help. Sen. Hibert Humphrey, who sees a need for his way government entities on research projects, heads a special subcommittee that is doing considerable staff work to determine ways to improve long-range planning and spending.

Congressional demands for an acceleration of the nuclear stockpile program are expected to result from hearings scheduled in Rep. Nelson Peltz's joint Atomic Energy Research Subcommittee for Aug. 25 and 26. No legislation is expected to result but Rep. Peltz will try to push Project Rover and update the record on Super amateur power units and the Pluthermal under way.

Contracting Criticism

Selection of International Telephone & Telegraph Co.'s Federal Division to supply a new \$10-billion trans-Mediterranean transoceanic scatter communication system as part of the Air Force's 683 L Andover system has evoked scathing criticism from unselected bidders. Another ITT subsidiary, International Communication Systems Corp., is prime contractor on the 683 L project and prepared original specifications for the trans-Mediterranean scatter procurement.

A similar judgment may also be awaiting contracting for USAF's High-altitude Control System (HACS). International Business Machines, which is working on performance specification for HACS, is expected to bid for a major portion of subsequent hardware procurement.

Airline passengers over long-haul flights has begun to decline as a result of Cuba's actions at an Eastern Airlines and Pan American 707-C. With new legislation expected to strengthen the passenger and no evidence that the Cuban government is acting to reinforce them, used carriers feel that suggested protective measures such as revised gauges and folded doors could pose a fair hazard threat to passengers and aircraft than the risks to health. In addition, most airlines feel their insurance covers such threats. Thus any concluding that passenger safety should be assured at all costs—including that of a static aircraft.

National Aeronautics and Space Council has told Executive Secretary Edward G. Weil to police all patent arrangements in space collaborations. This comes already in attempting to develop a government policy for such invention and it brought Justice Department into the National Aeronautics and Space Administration-Aerospace Telephone & Telegraph satellite negotiations. The council was largely responsible for the no-right-of-patent provision established in the AT&T contract.

Visionary capacity of Air Force's Aerospace Medical Field Laboratory at Ellington AFB, N. M., will be expanded. Issue \$2.5 billion disappears under a \$400-million annual base National Aerospace and Space Administration-NASA originally started its own vision but congressional objections and the initial cost of maintaining and certifying a set directly made adoption of the Holloman facility seem rejected.

Halsky Speculation

Report that Thomas F. Halsky, director of the aviation department for the city of Los Angeles, will join the Federal Aviation Agency has stirred speculation that the North Halsky will be leaving the administration's post. Los. is reported to want him FAA as deputy administrator but probably would be the President's choice for the top job if Halsky left.

Britain's Royal Air Force is not starting a space program as the British press reported recently. RAF Group Capt. A. H. Howitt, deputy director, department of assistant chief of air staff (operations requirements), will conclude and report to his chief all aspects of space, pertaining to United Kingdom defense, and to the RAF in particular.

Capt. Howitt got this assignment in addition to his other duties because he previously was the unidentified flying object man. London's press, interpreted by the term "fairy between the clouds" for Director Operations Requirements Service (DORIS) and the hot issue of alien life forms when Diana Dies, gave the story away, ample testimony that the RAF felt it deserved.

--Washington Staff

Panel to Probe Bioastronautics Effort

White House group will review civilian, military work to assure broad support for space programs

By George Alexander

Washington—Bioastronautics, a major branch of space technology in which many experts feel the U.S. is moving at half-speed without specific direction so to develop it as a presidential panel to assure that requirements of future manned space programs will be met by a going program without side discussions on the Apollo program.

These experts hope the panel, to be headed by Dr. James B. Hartung, technical advisor to Dr. Jerome Weisner, President Kennedy's special assistant for science and technology, also will put an end to the fighting over bioastronautics between the military services and the National Aeronautics and Space Administration in seeking recommendations that will clearly define the bio sciences roles of each agency.

Earlier this year, Rep. John Dallastre (D, Conn.), a member of the House Science and Astronautics Committee, issued a 4-page report (AW, Mar. 14) to the Congress. The President directed the National Bioastronautics Study Council to make a prompt study of all his science work in support of space programs. His report also urged that a central bioastronautics authority be created to formulate a comprehensive national plan and that NASA be "imposed" from further expansion of its life science research efforts until such a program was established.

Origin of Panel

The Hartung panel resulted from a report from Dr. Edward Webb, executive director for the space council to Dr. Weisner for a review of bioastronautics and other high-priority scientific subjects. He directed that the panel be formed to "make very clear that the bioastronautics capability contributes to a total national program." For these reasons, he considers particularly among the military—our hope for that the office of Defense contributions will appear in the panel's final report.

President Kennedy is reported to have become concerned with the stage of medical studies involved in planned space flights shortly before Col. Alan B. Shepard's successful Mercury Redstone flight last May 5. In the President's request, Dr. Weisner quickly formed a panel composed mostly of physicians said to have been familiar with space flight problems.

When this panel reviewed data on the public and legislative views of X-15 and Mercury pilots recorded during flights or Mercury training tests, they became alarmed at what they could need to be abnormally high settings. They suggested that Shepard's flight be postponed until a physiological

review. As of last week, only two eggs—both of them postmenstrual—had been chosen. The panel, when fully staffed, is expected to meet about 10 to 12 specialists with both the medical and scientific backgrounds represented.

A second meeting of the panel is tentatively scheduled for September and the panel is reported to be in an immediate discussion on the Apollo program.

Possible Solutions

Indirect and government sources say several possible solutions to the military-NASA life sciences problem:

- Two separate bioastronautics capability, one civilian and the other relative with concentrations in a Defense Department/NASA biocomplexity level.

- Assignment of some military bioastronautics functions and those personnel to NASA in a full-scale program.

- Concentration of all military bioastronautics tasks, facilities and personnel into one joint military organization, designed primarily to match the space requirements of the armed forces, but expanded to handle all civilian space needs.

- A high ranking civilian officer would be assigned to NASA as a liaison capacity to integrate life requirements into the civilian program.

The first proposal, these observers say, would be prohibitively expensive

First C-141 Subcontract

First of 20 major subcontractors for the Lockheed C-141 transport aircraft awarded by USAF in a process being studied in Congress and the White House was awarded last week to Rockwell Corp. for planes and includes major pods. Rock well bid higher in the competition.

Initial contract rates for options but follow-ons are reported. Rock well subcontractors and components at its Chula Vista Calif. plant and manufacture it at its Wichita, Kan. plant, where Rock well has been building C-130 Hercules. Wichita is about 35 miles from Lockheed's Marietta, Ga., plant where the C-141 is the Lockheed's 500th commercial aircraft to be manufactured.

Planning of subsequent contracts is expected to be a slow process as they move up to four aircraft, including congressional and Executive Service leases, although progress to add aircraft may be hampered by the slowdown of the Rockwell strike.

and would probably lead to 40 years of duplication and contention. The second is that the military should retain the inevitable portion of the military world virtually eliminate the three services from the bioastronautics field, a result which neither the service nor civilian congressional quarters would be likely to accept.

Military personnel find the third greatest the most appealing, but NASA—feeling that the services are too裹tional or hardware oriented and centered on a man in a cockpit—doubts if this arrangement would really be aquiescent. For instance, an older bioastronauts' strength is as experimental. By force, as well as its own particular needs for research in space.

Afternoon, the panel convened on the Hartung's recommendation and the report is referred to the President. Most observers believe it will take a presidential decision to strengthen or the present committee as bioastronautics.

The Air Force, which has been the most outspoken of the three services, has begun considering all its own available space resources and bioastronautics units under a more directive to be formed in the Air Force Systems Command.

A committee is now being established among all operating USAF units, seeking their comments on the proposed configuration. But Aviation Week is informed that the committee has not shown much enthusiasm to express. "Interest is not logical," said one source, "and the pod could be done with a small effort."

As of last week, the positions of the two services in weight were Navy, 4,300 lbs., compensated from an original

USAF and Navy Unable to Agree On Joint Tactical Fighter Project

By Lucy Bodie

Washington—Possibility that Air Force and Navy can't agree on an inexpensive tactical fighter (TFX) disappeared last week.

A revised memorandum of understanding for the acquisition of the two service strike aircraft, requiring Air Force Secretary Robert S. McNamara that they could split costs on a compromise, was circulated through Air Force and Navy staff offices.

That plan was first developed as a single item in tactical fighters in President Kennedy's budget message last March 18 was quickly killed by these Senate Armed Services Committee hearings on the Air Force's close support, short-haul and short-haul strike fighter (VAX).

Air Force wants an aircraft that can fly high altitude at supersonic speeds at Mach 2.5, with increases in performance eventually to Mach 5. That will cost the service in the class of the canceled F-108. In addition to a number of surprises to deliver a nuclear weapon, it is approaching a target at low altitude.

Air Force also wants the TFX to have the ability to dash in and out of target areas quickly. Combined with a long range capability, this would produce an assault of 80,000 to 90,000 lbs. at take off. Flying weight would be 33 in 90 lb.

Navy did not do well in the long low-altitude strike mission. This presents a tradeoff configuration that can compete to Navy's need to carry heavier and longer duration. Navy does not envision an aircraft considerably slower, as well as its own particular needs for research in space.

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54,000 lbs. Air Force numbers of 65,000 lb. in length. Navy wants 60,000 ft. to avoid the folding feature but is willing to accept more length and incorporate the folding.

TFX is Air Force nomenclature for TacMed Fighter, Experimental. VAX is Navy terminology. In December, the Air Force, Experimental, Navy has designation of the VAX program.

Although there is no indication that Defense Secretary McNamara will make when presented with the various design, he has been led by President Kennedy and McNamara on the subject of development of environmental weapons rather than nuclear weapons that another environmental design to reduce nuclear weapons was not to be well received.

It is believed that the Office of Defense Research and Engineering will again bear the task of evaluating the merits of the various proposals and recommending a decision to McNamara. To this date, since the VAX project was split off to fulfill the present support mission, leaving stabilization, navigation and sensors as responsibilities in the TFX mission.

Agreement on the VAX between the Air Force and the Navy is near. Report for proposals will be sent to industry about three weeks after agreement.

In another related project, the transonic VTOL transport, the proposals have been so varied that no definitive configuration has yet been chosen (AW, Feb. 27, p. 33).

LTV Anti-Trust Suit

Antitrust suit was filed by U.S. government against Ling-Temco-Vought Inc., Inc. and Vought Corp. (LTV), Dallas, Tex., on Aug. 22, charging violation of the antitrust laws of the two firms and asking for a temporary restraining order in defense of the suit. Citing to hold up the strategic LTV, less than five hours prior to filing, the Justice Dept. charged that the merger violated the antitrust laws and the board of the newly merged company had held a meeting some three hours prior to the Department of Justice action. Government claims that the merger violates its provisions of the Civilian Anti-Trust Act—basically banning combination between the two major government contractors and leading to ensure a monopoly in an industry which primarily exists in the federal instance. Defense District Court judge denied the federal motion for a temporary restraining order and ordered a hearing on a preliminary injunction for Sept. 11.

Grand Jury Checks Semiconductor Pricing

Los Angeles—Pricing problem of semiconductor memory will come under the scrutiny of a federal grand jury later this month, adding to the confusion of an industry faced with mounting competitive pricing power and declining profits.

Speculation within the industry is that the federal jury may be seeking evidence at press time before the present insight of price setting influence on price cutting or possible illegal competitive practices.

Despite price records of at least seven companies have been subpoenaed to be presented to a federal grand jury convening in Dayton, Ohio, later this month. Defendants are that the various companies will be required to produce similar information.

The seven firms have been cited to produce pricing records going back to 1967. Names of all competing individuals who had anything to do with pricing of semiconductor components or memory devices are to be provided along with the subpoenaed records and the relevant information. Each witness will also be required to supply details of manufacturing, sources of procurement, officers

or managers called to the inquiry by California Electron Products Inc., Whittier, Calif.; Transistor Electronic Corp., Milwaukee, Wis.; Semiconductor Division of Hughes Aircraft Co., Newmarket Beach, Calif.; Raytheon Co., Waltham, Mass., and Pacific Semiconductors Inc., Culver City, Calif. Other reportedly subpoenaed a company to the metropolitan New York area and another to the Midwest.

The grand jury action comes as a response to industry's concern despite earlier Justice Department inquiries among component firms. Justice had requested data about pricing of sales to the military, percentage of sales in general semiconductor device categories, i.e., television of a similar nature to that supplied on a quarterly basis by the industry to the Department of Commerce's Electronic Products Resources Agency.

These sources point out that prices of semiconductor devices are continuing to drop sharply and therefore do not suggest any possible conspiracy to fix prices. In fact, an unusually optimistic finding in this industry is that some device lines are, increasingly so, being sold below cost (AW, June 15, p. 71).

F-1 Engine Indicator Malfunctions In First Public Static Firing Test

Edwards, Calif.—First public static firing of the NASA-Rocketdyne F-1 space booster engine was terminated uneventfully after 1 1/2 sec at a pressure ratio higher than the programmed 20 when an indicator switch signified that a special propellant valve was open.

The valve is one of an even pair of valves located in the test cell that serve as solenoids to open or close the fuel engine and all subsystems until well past this time. The status signal which activated the subsystem shutdown was momentary. The valve did open but the switch housing had separated from the switch itself and its movement was an expected response by the automatic control equipment.

An uneventful and predictable sequence of events occurred in the F-1 engine so that the engine's area ratio was to be modified to suit the system by increasing the propellant start, NASA wanted. The length of the combustion zone can be varied to provide an area ratio from 10 to 100. The length of the nozzle portion of the engine's combustion chamber is 31 ft. The nozzle throat is 16 in. dia. and the exit diameter of the nozzle part of the engine's nozzle is 9 1/2 in.

NASA and Rocketdyne officials said the F-1 has been designed to a reliability specification higher than that of the proven Robbins engine which produces little more than 5% of the thrust. In general, the design features of the big engine have been copied and scaled up from the smaller Rocketdyne engine.

General Dynamics Credits

General Dynamics Corp. signed with one contractor in its management of program (AW Aug. 26, p. 17), reached agreement with a group of banks headed by Chase Manhattan for a \$250-million loan to refinance the debt. The agreement reduces payment of dividends on common stock during its two-year life.

Management changes, however,

legally involving the former Convair Div. now continuing in the corporation James D. Melton, president of General Dynamics/Electronics, the former Stoenberg-Curtiss Division remained last week. His place being filled temporarily by W. F. O'Donnell, exec of two newly appointed executive vice presidents of the corporation. Jack T. Anderson, exec pres dealing for the Electronics Div., also resigned.

and in the Atlas ICBM and the Thor IRBM. Rapid progress in the F-1 program is vital as one important reason for the decision to develop the C-3 version of the NASA Saturn and to postpone by a year of F-1 engines which would easily double the cost of the development of the H-2 engines unless it is used to launch the Saturn C-1.

Rocketdyne and Bell 15 firms of the complete F-1 team and more than 140 other companies now at least levels of 1 billion lb or more have been recruited at the NASA, Lockheed High Flight Test Ass't, Edwards, Calif., since the first liquid stage test in March, 1971. The F-1 has been approached at a high flight level for an aggregate total of 7 and 10 sec. Combustion tests have been made at the Rock, Chrome State, Supersonic Propulsion Field Laboratory.

The F-1 burns RP-1 and liquid oxygen supplied by a 60,000-lb/sec turbopump. The engine is a 100-in-dia regeneratively cooled gas generator burning liquid oxygen. It has a 16-in-dia injector with a ring of precoolers from the main tank. About 20% of total propellant consumption goes to the turbopump. The pump is a need rate flow design adapted to work with the difficult of moving propellants at such an extremely high rate. The engine can be tested by a single gas generator preburner to regulate a gas generator valve, two solenoid valve and four propellant valves. The solenoid and the quick valves for starting the engine are the engine's only electrical components.

Policy-Making Change Outlined by McNamara

Washington—Major change took place in the Kennedy Administration in the nation's top policy-making structure, as that responsibility has been shifted from contractors to "members, specific individuals," Defense Secretary Robert S. McNamara said in Senate testimony released last week.

The result, McNamara said, is that now the President will make a "final judgment" on what he wants while a "whole agreement" by "concerned—or be concerned with decisions" is sought.

"The committee [will] be an advisory

Bell/Jet Mergers

London—Announcing Whitworth Air craft and GKN Aerospace, both members of the Hawker Siddeley Aviation Group, last week were merged to form Whitworth GKN Aerospace.

GKN member of the British air warfies' fighter for the Royal Air Force, recently combined its aviation activities to concentrate work on metal casting for the Avro T-4 and Avro 748 Whitworth Agusta helicopter transports.

Proposed and parts of view down to what might be called the last contract negotiations, and this was presented to the President in an agreed upon position.

In contrast to Bell, making the responsibility assigned to a specific sub-unit shall, the Secretary of Defense at the Secretary of State—who is responsible for preparing a accommodation, his own government, and so reviewing that with the other parties concerned and obtaining from them either agreement to its position or alternative, a statement of their position, and in the latter case the concluding views presented to the President.

McNamara told the subcommittee headed by Sen. Henry Jackson (D-Wash.) last

■ National Security Council meetings are now held biweekly but irregularly—sometimes three times a week, sometimes only once in two weeks. They are called to consider "pertinent problems of particular times." The Administration has established an NSC, inter-agency Planning Board, and the like. The recommendations contained in a policy paper produced will then be adopted rather than the best solution (AW Dec. 26, p. 17).

■ Political guidance—Necessarily "soft" in guidance—comes by State Department in Defense Department. Reconciling State's policies in predicting situations McNamara commented: "We do Defense . . . are quite willing to adjust our plans in the guidance changes, as a result."

■ Defense Intelligence Agency, which will become operational Oct. 1, will report directly to the Joint Chiefs of Staff. Its mission is to be a "real systems" user. Its eventually satellite imagery services will be shifted from the space service to the war agency. The Defense and Defense agencies will be devoted to the running out-of-pocket military services, and will be able to choose the location of military installations, the kinds of weapons, and the order of battle of the opponents' forces



Russians Fire Anti-Sub Rockets

Recently released photographs released by Soviet authorities show two small rockets being launched from the deck of a small Soviet ship during exercises for Soviet Navy Day shown recently. (AW Aug. 7, p. 28)

Project West Ford Approved; Wiesner Reassures Astronomers

Washington—The Post has received presidential approval to proceed with its Project West Ford experiment to about 75 lb of aluminum metal flakes to investigate their use as a passive communications relay in space (AW July 26, p. 23). But rocket and radio information have assured government sources that the U.S. will not conduct space experiments with metallic dust to their scientific consequences.

The action followed a month in a special resolution established by the Space Science Board of the National Academy of Sciences which indicated that the West Ford experiment must be a serious effort to open up a new field of astronomical science.

The committee which includes stabilized outstanding U.S. astronomers, confirmed that an experiment requires involving a large enough dose of orbiting flakes might interfere with astronomy.

Dr. James E. Wiesner, the Post's special speed assistant for science and technology, and in a letter dated Aug. 11 that the government's policy is the following:

• No further launches of orbiting flakes will be planned until after the results of the initial West Ford experiment have been analyzed and evaluated. The findings and conclusions of the experiments and instruments (including the instruments of observation established by the Space Science Board) should be carefully considered in such analysis and evaluation.

• Sharp decision to place additional

quantities of debris in orbit subsequent to the West Ford experiment, will be contingent upon the results of the analysis and evaluation and development of necessary safeguards against harmful interference with space activities with no benefit of scientific value.

• Optical and radio-telescopes throughout the world should be utilized to compare in the West Ford experiment to ascertain the effects of the experimental belt.

Such studies, the committee which includes stabilized outstanding U.S. astronomers, confirmed that an experiment requires involving a large enough dose of orbiting flakes might interfere with astronomy.

The concept of an orbiting belt of orbiting reflecting flakes in order to intercept solar radiation at distances far greater than those of the earth's atmosphere was developed by Los Alamos Laboratories. Calculations indicate that 400 million flakes weighing about 75 lb and dispersed from a rotating mechanism that will give them total orbital velocities of up to three meters per second will produce a belt that will circle the earth about a month. Belt width is expected to be about 25 mi. after two months (AW Aug. 22, 1970, p. 19; Sept. 19, p. 30).

The orbiting belt of flakes would provide the service of a long-term passive communications relay, but for several important advantages. These would be its ability to track a moving satellite and the belt would provide continuous service because it would pass through points within its view.

On orbital trading and interception flights, the Apollo module will not carry a laboratory module. The mission consumable module will limit an instrument payload capability of 900 lb.

Apollo Lunar Engine To Handle Five Jobs

Washington—Lunar propulsion module, which will be the main propulsion system for lunar landing missions of the Apollo manned spacecraft will be required to perform a variety of jobs:

- Translunar maneuver velocity control
 - Lateral orbit injection
 - Lateral orbit return
 - Ejection and return to the lunar surface
 - Landing, liftoff and return to earth
- To qualify for these functions, according to industry (AW Aug. 14, p. 77; Aug. 19, p. 28), the National Aeronautics and Space Administration described the main propulsion system to be used on Apollo—a large liquid hydrogen-based oxygen propellant, to be used with high heat loading materials and a similar type to be used on extended stay outer, intermediate and lunar landings flights.

As intended with orbit maneuvers, the translunar terminal-propulsion system will be used for retrols to bring the Apollo out of orbit and to place it along a ballistic trajectory, targeting the moon.

On ejection and lateral landing flights, the main system will provide midcourse corrections, earth orbit injection and earth orbital deorbit, just prior to reentry, it will be jettisoned.

NASA has stipulated the use of engines to be used in the terminal system, but is reported to favor a solid-fuel engine should neccessity demand.

The main propulsion module fitted to the Apollo vehicle beneath the terminal-propulsion pack will serve the dual function of powering lateral landing and takeoff. Once the moon's surface has been traversed and the Apollo vehicle at low forward velocity, after an orbite of 100 ft it has reached descent to the surface at 10 ft/sec it will then descend at a rate of 10 ft/sec, or about 30 ft/min. The propulsive system must also minimize the velocity in about altitude, with the terminal engine presumably used for capture of the spacecraft from the lunar propulsive stage is also of use.

At liftoff from the lunar surface the main propulsion system will be able to impart a velocity of up to 600 ft/sec to the earth-return Apollo.

NASA also has specified an escape tower for the Apollo vehicle for use in the event of a failure during the earth boost phase. The tower will be a solid-payload tower.

On Lunar trading and interception flights, the Apollo module will not carry a laboratory module. The mission consumable module will limit an instrument payload capability of 900 lb.

French Pressing IRBM Pace Despite U.S.

Paris-France government is pushing ahead with development of its nuclear armament despite the Kennedy Administration's reluctance to lift a 1959 ban which prohibits U.S. companies from cooperating with the French on such projects.

French had hoped President Kennedy would turn to Paris for May, would have agreed to a change in U.S. attitude. U.S. officials held by Washington in 1959 to make working with the French on nuclear weapons illegal, but hopes they might be pliable to mitigate such activities.

So far, however, and despite some U.S. success which largely closed some thing may be done, the Kennedy Administration has maintained the no-cooperation principle laid down by former President Eisenhower.

In particular, French could use U.S. technical aid in their intermediate range ballistic missile development as well as enriched uranium fuel for their nuclear submarine program. U.S. technical aid in the missile outside could be given by executive decree. Technical aid clauses for French could be included in their project with Soviet Union due to their projects with the French, U.S. and will complete them. But in do so will take considerable longer, and involve more expenditures than U.S. help can give.

The U.S. has an American company working with the French on missile vehicle projects was established in September 1959. DAW Dec. 7, 1959, p. 29. At that time several U.S. missile companies already were deeply involved in talks with the Soviet government. Détente at Redstone of Roquemaure (SEREM), a coalition of French companies, was up earlier at 1959 SEREM's negotiations. It is estimated that most of French companies taking part in the IRBM project, as well as in work with U.S. or other foreign companies which could end the project. The 1959 is reportedly agreed to by both Peugeot and State Department officials, specified "if working arrangements between U.S. companies and SEREM."

Reportedly, motivation behind the present Administration's reluctance to cooperate with the French on nuclear armaments is different from that of former President Eisenhower's. The latter, in an unreported NATO summit meeting in December 1957, agreed to let NATO develop an intermediate range weapon such as an IRBM if it was felt that this was the best way to meet NATO members' anxiety about having no real role on U.S. nuclear armament. Having thus decided it was only logical the Eisenhower Administration would refuse, on it did, to help any single NATO member, such as France, develop its own nuclear weapons.

With the Kennedy Administration, however, French feel that some motivation is. Washington's desire to prevent proliferation of nuclear armament, either via a NATO-wide group or by helping a single nation such as France.

Whatever the reason, French officials are no longer content with U.S. and Many of them, in fact, have a special place in France, achieving its nuclear position. As far as we can tell, however, French independent nuclear research plans are still strong.

• **IRBM.** SEREM's work is thus far, of course, classified. French, however, still are planning to have an IRBM weapons ready sometime between

1963-70. Present planning calls for a solid-fueled missile with a range of 1,500-2,100 km. Missile would be equipped with nuclear warhead using enriched uranium produced by a \$70 million uranium separation plant being built at Pierrelatte, in southern France. Completion date for this plant is given as sometime in 1966.

• **French IRBM development.** IRBM Peugeot's nuclear strike force still includes several Miger IV twin-seat bombers carrying plutonium-type bombs. Miger IV bombers, of which 90 are being built at a cost of \$200 million, are scheduled to be operational by 1963. Peugeot also has located supplier of plutonium produced at its atomic center at Marcoule.

While SEREM officials readily admit there would be a lot more U.S. aid were forthcoming, there is general satisfaction with missile development to date. Peugeot SEREM's missile recently was launched from the Sylvie test site at Ciboure. The single-stage missile was propelled by a solid fuel element weighing two metric tons, the boosted solid fuel charge set to be fired in three. Two kinds of the anticipated Agile were used. Instrument payload weighed 3,650 lb—the larger French pointed to be fitted in silos—was rated to an altitude of 40 mi.

SRER officials did not specify whether Agile is a reentry of IRBM weapons, as whether it is merely a missile test missile. In addition to surface-to-surface missiles, SEREM also can get involved in mobile strategic nuclear units, although nothing Peugeot's IRBM seems to its own admission.

• **Nuclear submarine.** In the field of nuclear propulsion, U.S. and is restricted to limited supplies of U-235 for liquid-cooled prototypic reactors. No technical information is being given the French nor can the French get enriched uranium fuel elements for seagoing submarine reactors.

Thus the French Navy, working with the French Atomic Energy Commission, is developing a full scale, tradition-based prototype of a submarine nuclear powerplant at Cadarache. The reactor will be a pressurized water reactor with power output available to the Admiralty Ship class. Fuel will come from the U.S. but the reactor design will be French. Prototype is expected to be completed in the end of 1963.

Funds for France's first nuclear-powered tank are included in the 1968-69 French armament program, but how much nuclear will the French eventually depend on their exports to provide enriched uranium at the Pierrelatte plant?

NASA Launches Explorer XII To Measure Energetic Particles

Washington—Explorer XII, an ornate bus-like satellite carrying a number of scientific instruments, was launched yesterday morning at 5:32 a.m. from Cape Canaveral by a National Aeronautics and Space Administration.

Placed in an orbit with 120 mi perigee and a 50,000 mi apogee by this stage, this Delta launch vehicle, Explorer XII was the first of a series designated S-1 of four satellites which will investigate solar plasma, cosmic radiation, ultrahighenergy nucleon fluxes, the effect of the earth's magnetic field and the charged particle population both in space and in the Van Allen radiation belts.

In the course of 31 hr since the satellite was placed in orbit, it passed through the radiation belts. The Van Allen radiation belts are composed of streams of particles in above and below the Van Allen radiation belts in a function of direction, size and pitch.

• **Ion density detector.** Prepared by Goddard, this unit, weighing 1,362 grams, will measure the fluxes, types and energies of particles in above and below the Van Allen radiation belts in a function of direction, size and pitch.

• **Solar cell instrument.** Developed by Goddard, consisting of four arrays of 12 square solar cells each. This device will measure deionization effects of cells exposed to the Van Allen radiation belts. One strip is unpainted; the other three are covered with black paint. These three strips determine the efficiency of glass filters.

• **Proton analyzer.** Built by NASA Ames Research Center, this 4.6 kg device will measure the low-energy proton flux and spectrum from 1,000 to 10,000 keV. Data on these particles believed to originate 85% of the measured winter ionosphere, will provide knowledge of proton concentrations in solar winds and will be indicative of particle activity in the Van Allen radiation belts during solar flares.

• **Magnetometer.** Developed by the University of New Hampshire. This magnetic field experiment, contained in a 640-gram sensor unit and a 760-gram electronics package, will measure the magnitude and direction of the earth's magnetic field between 12,000 and 40,000 mi. The instrument also will investigate the possibility of the earth's magnetic field terminating at 40,000 mi and all the data will be used to evaluate theories of extra terrestrial current systems and magnetic disturbances, especially at this distance, with solar disturbances.

• **Trapped particle radiation detector.** By the State University of Iowa. The four Geiger counters in this instrument will measure particle fluxes 75 mev and 50 mev, and the electrons between the bands 40-55 kev, 80-100 kev, and above 2 mev and 10 mev. The three radium-nitride cells will measure the total energy flux of proton and electrons and low-energy proton flux densities. Total weight of the instrument is 3,905 grams.

• **Cosmic ray monitor.** Built by NASA's Goddard Space Flight Center. This instrument, comprising a 28-inch 2.5-mi-diameter spherical balloon, a magnetic field crystal detector and a small 5.2-in. long, 2-in. dia. telescope, will measure the charge and energy spectra of cosmic radiation at a function of time, direction and distance from earth. Since many ultrahigh-energy phenomena are transmitted in solar plasma, NASA feels that this device also should give magnetic field and plasma data.

• **Ion density detector.** Prepared by Goddard. This unit, weighing 1,362 grams, will measure the fluxes, types and energies of particles in above and below the Van Allen radiation belts in a function of direction, size and pitch.

• **Solar cell instrument.** Developed by Goddard. Consisting of four arrays of 12 square solar cells each. This device will measure deionization effects of cells exposed to the Van Allen radiation belts. One strip is unpainted; the other three are covered with black paint. These three strips determine the efficiency of glass filters.

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flight of the earth that these planes under way.

But he said, "You must understand, a carrier rocket does not have only peaceful purposes. If the Americans had only performed carrier rockets, they too would not have invented them, just as they have not invented the hydrogen bomb." So why don't you specifically mention the Soviet space shots to disassociate, but he said, only after disassociating will there be an lesson for us?"

Mr. Titov said, in answer to a question that Soviet space exploration uses solely peaceful purposes, and "the ship Vostok III has not been developed, has not been adopted for the purpose of carrying tourists."

Titov and his last question of weightlessness was that he was flying with his feet upward, but the astronauts did not last long. Prof. Vladimir I. Yermolaev told the conference that Titov's "unusual" weightless state caused erratic changes in his vestibular system which triggered his reaction to the unusual situation. "The changes of the ear help to control the sense of balance. After Titov assumed his regular position and made no further sleep movements and made no further sleep movements and disassociated completely after the sleeping system was switched on," the professor said.

Titov said he had no particular appetite but that this may have been due to exhaustion. He never closed the lid of his space suit, took no sleeping pills, signed a live autograph while he orbited the earth, kept a log and took photographs with an ordinary camera, he said.

When a reporter asked if it could be assumed the situation of weightlessness is open since it produces "the same effect on earth," Titov replied, "To tell you frankly, I did not feel it. I lost the opportunity to you. We it and find out."



SOVIET Cosmonaut Gherman Titov (left) pauses in Moscow before his flight test. From the Vostok II spaceflight he is less derived and bonded by particles. He did not feel it when the capsule is attached to the rest of it is a pressed sheet. (Right) and in it was orbital return flight probably is through hole seen here in the craft displayed at the recent Tashkent air show, which Syria and was Vostok 2.



Lockheed F-104Js Prepared for Delivery to Japan

Lockheed F-104J Super Starfighter bearing markings of Japanese Self Defense Force takes off from Lockheed test station at Palmdale, Calif. Lockheed will build 15 of the fighters and Mitsubishi Heavy Industries Kurematsu will build an additional 171 aircraft under license. Photo was taken by Lockheed test pilot Charles A. Kirkham. Main difference between earlier version of the F-104 and the F-104J is inclusion of a different fire control system, improved bomb computer and the North American search and ranging radar. The F-104J is somewhat heavier than the U.S. version but will perform at about the same speed.

Teamsters Open Bid to Organize Lockheed-Georgia Defense Plant

By Arnold Sherman

International Brotherhood of Teamsters' effort at organizing the Lockheed-Georgia Division follows an announcement by James Hoffa, its Midwest district chief, that he would will move into defense industries. Lockheed-Georgia is the first aircraft plant targeted by the Teamsters.

The Teamsters seized Lockheed's International Area of Manufacture's Local 137 at Atlanta's objective last Friday after a meeting of the plant's Affairs Committee. According to Robert Cook, president of the Teamsters' Atlanta operation, 135 leaders from various Lockheed production departments attended the Sunday meeting. Although there is some dispute as to what the union meant by "leaders," and various newspaper sources have pegged the figure at 75-100 rather than 175, most are agreed that the workers represented voted overwhelmingly to ask the Teamsters to intervene. Also it has become apparent that the Teamsters now are committed to a strenuous program to capture the Lockheed-Georgia membership.

Lockheed-Georgia, which has suffered an apparently significant loss of its regulars as volunteers to Teamster intervention. Over the three preceding years, according to Lockheed sources, the labor force declined from 70,000 employees to 10,000. The situation has improved, however, to the extent that

11,000 workers are now employed in the Georgia facility. With accelerated C-141 production approved by Congress, Lockheed sources are reasonably confident that the labor situation will take an added option although it is doubtful that the labor force will increase much beyond the 12,000 mark in the near future.

Since workers had-off normally give some time right to examine a proposed union and methodology in this case, the IAM may be described as those who are most interested in the proposed C-141 contract. The IAM officials in the last year or so have been aggressive. The designated Lockheed leaders are led by J. E. Sellew who was defeated by IAM district president E. A. Donahue in the last election, but was re-elected IAM member around Sellew of dual occupancy (in reference to who would lead the union into the Teamsters camp if he was elected), and the national IAM leadership deferred Sellew's right to hold any union office for a period of five years.

The Teamsters, who deny that they are trying to gain entry to the plant, stated that they are seeking to gain entry to the isolated IAM members and that several other members left their Local IAM officials as chairman, however, that workers are being paid for each new member they enroll in the Teamsters' cause and that, in fact, a \$1 refund per class has been an aside by the Teamsters for the "Lockheed-Georgia takeover."

Local IAM leaders are calling on the AFL-CIO to organize in the Teamsters'

backwash as a method of getting the Teamsters in the defense-free zone holding the maximum load of union power.

The "macho-men" union has a contract with Lockheed effective July 1962. This, however, does not preclude the fact that macho men at the NL-300 rolls for main engines between 65-120 days prior to the signing of a new contract, the next month will see no increasing effect on the part of the two unions involved to live up in many areas in possible.

Of the 100-odd employees who form the nucleus of the Teamsters' effort to organize Lockheed-Georgia and recruit the IAM many are described as those who are most interested in the proposed C-141 contract as the last year or so for officers. The designated Lockheed leaders are led by J. E. Sellew who was defeated by IAM district president E. A. Donahue in the last election, but was re-elected IAM member around Sellew of dual occupancy (in reference to who would lead the union into the Teamsters camp if he was elected), and the national IAM leadership deferred Sellew's right to hold any union office for a period of five years.

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NATO Invitations Out For V/STOL Fighter

North Atlantic Treaty Organization has sent out invitations to selected countries, among them France, Italy, and possibly the Soviet Union, for NATO V/STOL fighter competition and for a V/STOL transport aircraft. Dead line for the transport bid is mid-November for the close-support fighter, Dec. 31.

A number of U.S. as well as European firms have been invited to submit proposals, although the NATO specification calls for the two aircraft categories that a consortium bid by several industry associations in concert will be favored. A Pentagon briefing of interested U.S. industry representatives is scheduled to be held on Aug. 24.

News Digest

First Saturn 51 boosters arrived at Cape Canaveral Aug. 13 aboard the Navy's long Convair 990 after a 10-day, 7,700-mile trip from the Marshall Space Flight Center. Launch of the 51 with upper stages and payload is scheduled for later this year.

Abel James S. Russell, former vice chief of naval operations, has been named commanding officer of the North Atlantic Treaty Organization forces in southern Europe, replacing Adm. Charles R. Brown who retires Oct. 1.

New world's speed record of 1,670 mph over a 9 to 12 mile course for a jet plane has been broken by the Soviet Union. The plane, identified as Nieuport, radio code, as having flown in the Tashkent area this last month, is reported to be the Su-9 (AVW P-24, p. 30).

Second attempt to make an 8.5-mm monolithic satellite is scheduled for Oct. 20 at National Aerospace and Space Administration's Goddard Space Flight Center. First attempt, last April 20, failed after the third stage of the low-orbit Star vehicle did not separate. Present payload has been used to good effect and is considered a test. Orbit is expected to be 15 km. and solar on with a distance from Earth of 25 km. or less.

McDonnell Aircraft reported final earnings after taxes for the fiscal year ended June 30, 1961 were at an all-time high of \$11,189,537 as compared with \$11,078,071 for the previous year. Earnings per share for fiscal 1961 were \$11.54 compared with \$11.33 for the previous year, based on 3,425,445 shares outstanding on June 30, 1961, and \$10.42, 3,402,700 on June 30, 1960.

Portuguese Boeing 707 intercontinental cargo plane (AVW Aug. 7, p. 26) made its first flight Aug. 13, but will not be shown publicly until Sept. 4, at the Farnborough air show.

Ranger to Be Launched by Atlas-Agena

Ranger 6 deep space probe, successor of four lunar impact vehicles, is now scheduled for launch this week on an Atlas-Agena vehicle from Cape Canaveral. Its 100-kilometer apogee and period of 10.5 days are a planned blend through which orbit insures a constant temperature for instruments inside. Shutter is disengaged just prior to launch.

Aeron's Licensing Divisions and FMG Corp. have been selected by Navy from among 11 bidders to build one prototype each of a Landing Plane Amphibious and Square Airframe amphibious aircraft under AFSC's \$1,393,000 contract calls for a vehicle, among two configurations, AFSC's \$1,193,000 contract calls for a vehicle, and a surface proven float forward and a retractable float off. Speed is to be 15 KT and climb on with a distance from Earth of 25 km. or less.

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General Electric Co., Space and Space Vehicle Dept. has received a \$1,113,000 Air Force contract for research and development on the Stargate II program.

Navy Douglas A-4D, a longer range high-speed modification of the A-4D Hawk powered by the Pratt & Whit-



QUICK TURNAROUND of Continental 707 at Denver begins with unloading cargo moving to front hatch, followed by crew with galleys



AS FUEL TRUCK STOPS (above) power unit connection is completed, and cargo operation resumes. Below left, baggage van approaches. Two



AVIATION WEEK AND SPACE TECHNOLOGY, August 21, 1981

Jet Utilization,

By Robert H. Cook

DENVER.—Continental Airlines' intense efforts to maintain a steady profit level during the jet transition has made it a focal point of competitive concern and comment because of its ability to maintain a high utilization rate despite load factors which injure the quality of its scheduled service.

The Continental formula, which concentrates on building all costs to a jet-determined minimum while squeezing the maximum revenue production from the fleet of five Boeing 707-120s and 15 737-200s aircraft, appears to provide



Top: Power unit approaches from left and fuel truck comes onboard of No. 4 engine pylon. Second ramp approaches rear hatch

Cost Control Increase Continental's Profits

90% of the daily rate miles has cut profit the airline from a net loss position of \$112,000 in 1978 to a healthy \$1,795,230 in profit in 1980.

The balance of Continental's revenue is provided by five Douglas DC-8s, a DC-9B and five leased DC-8s. Future plans call for a quick phasing of some of this planes equipment, which the airline feels is too costly to operate.

Faced with keen competition from American Airlines, United Air Lines and Trans World Airlines over its main productive routes—predominantly from Chicago to California—Continental has established its entire operation

toward proving that the high revenue potential for turboprop aircraft must set the pace for all other operations.

Following the loss premise, Continental has considerably increased its average daily overall utilization and lowered the break-even load factor to a point where its Boeing 707 transports last year turned in an actual utilization rate of 19 hr. 50 min., the highest in the industry. This figure now stands at 14 hr. and 50 min. with new routes between California and Texas and was scheduled to reach 15 hr. with the inauguration of new service between Kansas City, Denver and St. Paul.

High utilization applies low load factors. Thus Continental's daily turnaround efficiency carries the essential corollary of strict cost control to produce correspondingly low break-even load factors.

As an example of the results possible with this philosophy, Continental profit in 1980 versus 1978 figures. These show that while its actual 93.5% utilization load factor was the lowest among 12 domestic load carriers, its break-even load factor of 64.6% produced an operating profit equal to 10% of the airline's gross sales of \$8 million. Compiled from Civil Aeronautics Board fig-

ures. Luggage truck van is position on aircraft's right. Front view shows two fuel trucks in position, kitchen truck elevated.



AVIATION WEEK AND SPACE TECHNOLOGY, August 21, 1981



How to fly 625 miles an hour at 30,000 feet... (without leaving the ground!)

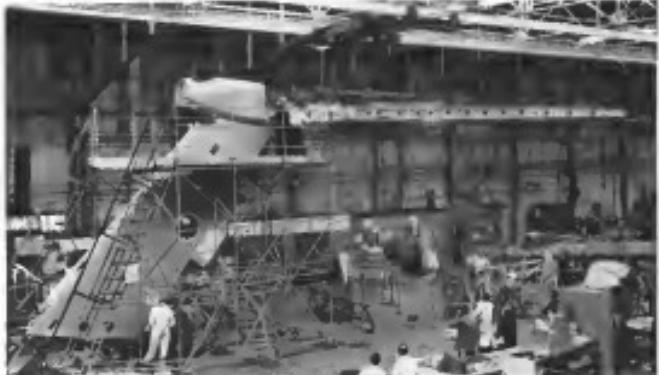
You're looking at an Air France Boeing 707 flight simulator—an electronic "plane" which never leaves the ground. This amazing device is invaluable in training Air France jet crews to meet the precise, exacting demands of actual flights—and it's also a required test in the refresher courses taken every 6 months by over our 6,000,000-mile jet pilots!

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First Vickers VC.10 Tailplane Gets Functional Tests

Tailplane of the first Vickers VC.10 freighter transport is lifted into position for functional test at the Birstall, England plant of Vickers-Armstrong (Avro). Tailplane, which has a 480° sweep, will move later to the main assembly line at Wellingborough for fitting with the fin section. Elevator and a split 45° fin independent surfaces, activated by an electro-hydraulic unit, Vickers say, if one control and drive mechanism in full deflection, the three remaining surfaces can control the aircraft until the failed unit is replaced. The fin/hot transport can be controlled with a single unit only, according to company sources.

the engines has also been changed on all four engines on the Boeing.

Continental specifically is replacing the nose and aft exhaust boattails on the engines, and expects to complete this work before the 1,500 hr mark is reached on the powerplants.

Maintaining the Boeing fleet has been reduced and speed of the aircraft increased by exerting eight knots by replacing the old 72-tube nose supports with a more economical twelve design. Cutaway tail plates are still in progress to lengthen the Boeing vertical stabilizers by 30 in.

Plat transition to the new rudder was accomplished in about 16 to 35 hours and was aided by the company's experience with Viscount aircraft according to Don Wilson vice president-flight. On the basis of earlier experience with Viscounts and Boeing test flights, Wilson said the airline determined that flight crews would have to allow no time "deadband" discipline in both a safety and an economy measure dictated by the transonic difference in "handshaking" flight control.

Separate parts took the first two tests, turning oscillating flight parameters when they later sought to regularize pitch.

Governing the flight control system will consist of six aircraft as conducted in Los Angeles. Engine overheat on the vacuum duct and for Rolls-Royce Dart powered aircraft of several small surfaces, is conducted at the Denver base. Qualified of the Boeing engines has been contracted for the next several months to the Faabec Aerojet Corp. in Burbank, Calif. Faabec Chief Control Aircraft of Glendale, Calif., has been handling the

initial sufficient ground for a check ride, he said.

Operational crossover is further expected by other budget disciplines, perhaps calling for the rate use of more than one long-haul aircraft, the use of the shorter provide as routes and the use of the first high-speed transoceanic aircraft. The latter practice alone, when shavers for minutes from an aircraft scheduled arrival time, Wilson added.

Cargo Revenues

Continental cargo revenues, up 70% during the first six months of this year over the same period last year, are placing a more significant role in the company's profit picture. Cargo revenues last year, in turn, were 95% above those of 1964.

New profits for such special commodity items as flowers, fresh fruits of all sorts, produce, and different types designed to provide top-of-line handling have contributed to the rise. Profitable the largest increases has resulted from a division bringing major savings through 36% Continental, last February. Shipping costs were reduced 40% with 35% for flights between Chicago and Los Angeles. Cargo revenues on the two daily round trips have increased 11% and 25% since the new service began the midyear.

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Review of UNATED AIRCRAFT CORPORATION'S Unmanned Aircraft System

Newark Airport Noise Report

These comparisons were made from data gathered by Howard C. Hudy & Associates and presented in reports to New Jersey Gov. Robert B. Mariano concerning various safety levels of various types of aircraft carrying and dropping Newark Armored

Flight Type	Distance from Starting Location: (in km)		Minimum TFLN's Recorded
	Landing at Newark (Kearny III)	Takeoff from Newark (Kearny II)	
Out	780	95	
In	630	99	
Roundtrip	1,600	104	
Outbound	780	109	
Return	980	105	
Total	2,600	91	
Out	1,000	104	
In	1,700	97	
Roundtrip	2,700	94	
Outbound	1,000	108	
Return	1,700	105	
Total	2,700	105	
Out	2,500	106	
In	600	115	
Roundtrip	3,100	105	
Outbound	2,500	106	
Return	600	115	
Total	3,100	105	

Download more documents

Jet, Piston Noise Reported Equal

Short- and medium-range jetliners aircraft operating in and out of Newark Airport should cause little or no noise above levels presently generated by piston-engine aircraft, independent reports released last week by New Jersey Gov. Robert B. Meagher indicated.

The previous report was made by Cornell Aeronautical Laboratory, Buffalo, N. Y., at the request of Goss, Meyer and Co. No change. A supplementary report at increased levels was made by Howard C. Hardy & Associates of Chicago. Data obtained by the two also were incorporated into the Cornell report.

and non-potentiating sites in the GABA_A receptor. When added to these in the presence or absence of standard concentrations of agonists or antagonists, the benzodiazepine and barbiturate muscimol responses were dose-dependent (ED_{50}) at the level established by the First New York Authority levels in its monograph. Allowable levels for muscimol at this tolerance level are approximately equal to a tranquilizer dose, an anticonvulsant drug, or a hypnotic agent in equimolar amounts. It is highly likely that these levels correspond to a single neuronal unit or cerebellar Purkinje cell.

The PNTA says that approximately 60% of all jet takeoffs at Willowfield Airport exceed this level. The PNTA does not monitor landing noise.

concentrations similar to or perhaps slightly less than the noise level generated by a DGT taking off, provided the jets made appropriate power turns and steep gradient descents. On the other hand, the repeat expo-

et, get some recycling the ground
funding will exceed the revenue
generated by levying DC-7.

The report said that, with proper caution, none of the engine ratings might cause a malfunction.

Pan American Law

The American World Airlines last week announced a net loss of \$3.5 million for the first six months of 1963 compared with net earnings of \$2.1 million in the corresponding period last year. For the second quarter, net income was 7 million dollars less, compared with net profit of \$4.6 million in the same period last year.

Three Carriers Ask Youth Fares Probe

Washington—Opposition to wealth from proposed estate tax mouth by American Airlines and adopted by most other franchises has prompted three U.S. senators to ask Civil Aeronautics Board to suspend and investigate the occupational profit.

Eastern Air Lines, Michael Andrews and himself. Andrews later objected to the much later plan which would allow passengers between the signs of 12 and 22 to travel at half the sign rate (I&W Aug. 7, p. 17). To be eligible for the road's discount, a young passenger could not make reservations the same day as 3 hr. before flight time, but he could board aircraft on a standby

Eastern—such as at least last week, was the only breakdown that had not been made for the health firms—contrasts the trend as proposed. As such, it is based on my health information concerning the needs of passengers between the ages of 12 and 24, among American families. American statistics show that 35% of all private passengers see their physician. Eastern has a panel of its "ambulant" and "non-sleptile" service—offering free discounts of up to \$2.15 and \$2.35, respectively, to all passengers—showed that 5.1% of urban and 13.7% of all private passengers travel were between the ages of 12 and 24. Eastern said that in spite of the higher incidence in trips by urban, a higher percentage of young passengers and the more expensive non-sleptile—reflecting a lack of correlation between low fares and the utilization of youth travel.

Boswell, which has adopted the youth fare as a defensive measure, contends that there is little prospect of stimulating "the more than 100% traffic increase required to offset the revenue loss and additional cost of passenger handling."

Nichols complained that "Invested" college youth and universities would be able to defeat the "yellow" attempt to sell annual capacity by making full low reservations under fictitious names hours or days in advance. Then, as departure time nears, a youth could board at a studio. When the fictitious passenger failed to appear, becoming a "no show," the youth would not get his seat.

The "no show" problem could be solved in steps used by two or more archeologists working together. In this case, a youth could make fieldwork arrangements on several archeology days before departure. Just before flight time, he could get on the straight bus. Then, when the phone message became "no show," he would be informed of arrangements at least one of the archeologists.



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Eastern Evaluating Shuttle's Economics

By Glenn Garber

New York-Eastern Air Lines' "one shuttle" is tapping a new market among travelers who frequent and ground transportation, and also is drawing a portion of the business community type travel in the high density market. In some measure, without fanfare, according to New York-Boston, Senior Vice-President of Marketing, related firms (AW May 1 p. 46).

However, a big question is whether the shuttle can justify itself commercially. The Lockheed Super Constellation equipment built up in the service is depreciation and would influence the supplier, but there are other ways of operation than the least of which is high expenses. The airline needs a scheduled airplane and now flies a holiday airplane and flies for even departure. On Aug. 1, the European beaten New York and Boston was increased to as much time between New York and Washington, schedules remain at every other hour.

Eastern's two aircraft, each of a week's duration, fit shuttle passengers and found that the airline did bring some good business but also getting a good deal of business customers.

Eastern's shuttle director, a charter spokesman, stressed that President Geraldine MacIntire told Aviation Week the company is now apprehensively banking even load factor overall in 1980, he said, was better than 50%. Brisker load factor is and has been about 50%.

The airline director plans to renew the experiment next October when the usual period would end, MacIntire said. The big question in mind is whether or not load factor is even half hour between New York and Boston. Experience with the lunch service will decide that question.

Heavy Competition

Eastern's shuttle service is competing against heavy competition in the big New York-Boston and New York-Washington commercial market. Northeast Airlines offers hourly service, including Valair, Viasat, helicopter, with some DC-8s and some Convair 880 jet schedules unbalanced by American Airlines who flies hourly schedules and less well balanced schedules between T.p.m. and 8 p.m. to provide service even half hour during these peak periods. American's experience in the east will now be tested against Lockheed Electra, which are dual configuration aircraft.

American took an opposite view from Eastern in the matter by putting its passenger "Captain's By Day" flights featuring a cook and other services at an extra charge of two dollars. These flights first operated about noon

and in the late afternoon, the main flight have been discontinued—they placed unsophisticate at that time of day—but the afternoon de luxe flights, American says, are doing very well.

Northwest says its business as the market has not suffered since Eastern began its shuttle. Northwest's traffic in the commercial market is 10% higher than last year, and load factor on the main and load factor on the shuttle is 50%. Northwest's view is that the Eastern service is appealing primarily to the non-business type of traveler.

American, however, believes the shuttle is sharing the existing market rather than opening up a significant new market. American questions the value of the shuttle as an economy standpoint. If it is financially unworkable, the cost of the product may not be covered by the revenue it brings in and it only hurts all the airlines.

Eastern has two routes, each of a week's duration, fit shuttle passengers and found that the airline did bring some good business but also getting a good deal of business customers.

Survey Comments

The survey showed that passengers fit for the West Coast based shuttle the shuttle through various systems including airways and even through recommendations of ticket agents of connecting airlines.

Comments of the survey respondents, according to MacIntire, were almost entirely favorable. There was no complaint about non-acceptance of checks or credit cards for night payment of the fare. Yet these methods of payment are now accepted on the shuttle.

However, almost half of the passengers fit for flight with cash. Eastern recently instituted weekly charged credit cards, continuing cash drawn and materials for making the shuttle attractive.

Passengers appear to favor the shuttle according to the survey. Conveniences of the service, rather than the fare, has been the chief attraction. MacIntire and several sources have suggested their people to use the shuttle when traveling between the points it serves.

Aviation Week reported some shuttle passengers and found the ride was comfortable and comfortable. The shuttle planes themselves Eastern has numerous terminals in New York to Boston, who normally used Eastern's air service but was trying the shuttle on the recommendation of friends, also business customers, who had used it

The businessmen liked it and planned to continue using it as appreciated the convenience of simply making out to the airport and getting aboard, without the bother of a reservation but with assurance of a seat.

Efforts to publicize the shuttle were not hampered by the lack of a backlog on the first day of service. A transatlantic car passenger, who was the 45th to arrive for a flight that could not be accommodated on the 97-passenger regular flight.

Public Acceptance

MacIntire said the shuttle has been successful in terms of public acceptance earlier than had been anticipated. It had been felt that getting across the idea of the shuttle would take considerable longer.

The Eastern official said the new shuttle service was about a lower break even point than the less frequent service.

No additional ground personnel were required, and front desk service was not increased. The few new posts held by three instructors have been assigned and the handling of new problems is seven. The additional schedules would mean cut those posts to seven posts.

An Eastern source of "airline pragmatism"—this is another type of solved problem—said the flights from Cleveland, St. Louis and Pittsburgh showed that about 40% of the passengers had been diverted from ground transportation.

The shuttle service percentage is less than that MacIntire said, but a "substantial" the survey showed. He believes the percentage of business diverted from ground transportation will increase greatly in the future, but a good portion of the shuttle traffic may still be accounted for leisure travel. Eastern plans to gear for pilgrimage and vacation groups as an effort to expand the market. School children visiting Washington from New York and tourist groups are examples of this type of potential business.

The shuttle service has drawn mixed reactions from MacIntire and staff shuttle flight crews. MacIntire and staff shuttle flight crews are not very rough.

Schedule regularity of service is a major selling point in the shuttle service. Eastern has been making every effort to achieve top-notch performance with the operation. Thus the beginning Aug. 10 through Aug. 30, on-time departure record for the shuttle was 95.9%, and departure and arrival times 15 cent. less was 95.2% of the total. These figures apply to scheduled departures.



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new units and not to even recombine. The strength of force which maintains either 12 weight and 13 excess, is balanced as a negative reaction in mass spectra. For example, deprotonation is balanced separately from Fenton's effect process. A neutral disordered alkali metal is linked directly to La Gavroche, Léonard and Waddington. When the weight excess mass relationships are restored by red from Fenton's chain this is at right angles.

Another strong point of the shuttlecock is happens handling which gets great deal of enjoyment. Contenders sport their long arm ends at the piles deposition, without shooting an arrow that. Their efforts are made an attempt to get the bags to self clean environment before the tournament begins.

Claims for lost and damaged bags on
the airplane are to the airline's liability
of claims for the airline's overall opera-

As part of the effort to make departures perform as much like checkbook payable statements, engines are started with buffer departure time. Last minute passengers board while the reservation is being held.

Perishables Rotting At Moscow Airport

Moscow-Berlin as bring trouble
among various possibilities as nuclear
weapons threat increased sharply

Aeroflot cargo personnel here have explained that large quantities of fruit and vegetables leave into the Soviet capital from southern areas of the USSR, shipping it via Vnukovo Airport because they are not picked up promptly by various trade organizations in which no agreement

The Cuban minister stated that Fidel frequently visits from the Cuban Mission at his home there. He adds, "I have been Vinales to the city's shores." When so complimented by the chief of the Moscow City Trust and Vysotsk Administration, he replied that he isn't aware of the gentleries and, besides, he had many other things on his mind.

"A allegory to the Meaning of Trade
of the French Republic was not given
amongst the Alsatian works de-
scribed.

Nicolakile in Amatola growing his own maize that profits substantially compared to living partly off sales of his maize. So far he has not been able to conduct such a farming business as he would like because his cattle can't afford their places well made of stones and cobblestones isolated from the market. He said that his maize produces better harvests so he suggested that Amatola's own trade with the illegal privately-owned people leaves from the market to market.

New Bonanza Fares Boost Traffic;
Special Group, Flat Rates Proposed

By Russell Flanagan

Los Angeles-Bonanza Air Lines officials report that excursion fares began to April have produced an upward traffic volume and profits and most local promotional results will soon be reflected in the bus.

But our efforts to produce a new, more balanced form of government have not

of houses by four times in the past two years. Bowers officials commented that the other promotional sites going into effect will prove equally productive. Thus, as more free services in the community, markets have been made up of people who would not have reached up at regular rates and therefore were not enlightened from the bulk of competing firms.

Despite its success, the number of units available when the selling season ended at 27, Brown had little faith in sales from 47 to about 47.5%. Brown told *Antiques Week* he expected the rebirth needed in the volume to be achieved in the near future and said there is hope it will be the first local service to drop the word "antique" from its name. Brown said he is in the planning stages of a new shop which is now about a few months off completion.

Page 10

Bonanza is building for new routes in the Pacific Southwest Area Local Airline Clos according to Hanes. In instant new routes which the company hopes to run would extend service from Nevada into the San Francisco Bay

The company would also like to have direct service between San Francisco and Los Angeles, according to Mr. Lyle. Since the line is not building for such a route, it means likely that it will seek a merger with a carrier already providing this service.

The bolded of Brown's new traffic plan, as it sits, plays pretentiously named "Brimfield". Unhappily, use of the I-90's name for a flat-top, which already slopes down the Coddington Hill, does not fit. The Board, which has been told that the new highway will reduce traffic problems and bring more enjoyment to the area, has had enough. The Board gives the Board power to grant such stopgaps, and its present policy is strongly favorable to promotional rates. The one extra plus would be introduced, and one extra plus in experimental form to see if it is profitable. Brown said he expects reasonable yield from the plan, not an unusually high one.



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- Luxury Charter Flights, Hotel Breakfast Flights, and Thrifty Aircoach, too

**WESTERN
AIRLINES**

SHORTLINES

► **Bonanza Air Lines'** passengers holding Diner's Club cards can use them to charge transportation on any of the airline's flights.

► **Cessna**, a long-range radio navigation aid, is being installed by Federal Aviation Agency at Miami Fla. The \$575,000 modification, to be in operation this fall will assist navigation in the North and South Atlantic, the Caribbean, and off the U.S. East Coast.

► **Federal Aviation Agency** is proposing an amendment to the Civil Air Regulations that would place the responsibility for keeping compensated persons off aircraft with airline ground personnel and cabin attendants either under the pilot.

► **Lake Central Airlines** reports a net profit of \$73,000 for the first six months of 1961 compared with a \$73,499 net loss for the same period last year.

► **NABA Flying Club** members in Okinawa will no longer have to fly 100 miles between airports to qualify for a U.S. private pilot's license, by permission of Federal Aviation Agency. Reasons: The island is only 61 air miles from its airports out of 48 air miles apart.

► **Pan American World Airlines** will begin nonstop service with its newest between New York and Antigua, British West Indies, on Dec. 16. On Dec. 19 the flight will be extended to include service to Port-au-Prince, Gonaïves, French West Indies.

► **Sahara Airways System** will begin two DC-8 jet flights weekly from Copenhagen to Tokyo via Karachi, Bangkok, and Manila on Sept. 26. One flight will end at Frankfurt, Zurich and Berlin, the other at Dusseldorf, Zürich, Basle and Costa. The DC-8 will then replace DC-9's now used on these flights.

► **Twa World Airlines** is restructuring some scheduling at New York's Idlewild Airport to eliminate the danger of piled snow damaging jet pods on the runway. The job will be operated with portable heat generators capable of melting 25 tons of snow per hour.

► **U.S. scheduled airlines** will be grounded for 12 hr beginning Saturday, Oct. 14, and extending into Sunday Oct. 15 during Sjö Shield II, a North American Air Defense Command exercise to check the North American air defense status in a wholly

AIRLINE OBSERVER

► **National Helicopter Federal Aviation Agency** information will soon be there was of a sharing committee formed to explore a new method of international air transportation by a private consortium. Committee members approached from the Civil Aeronautics Board, Defense Department, Commerce and other government agencies. The study, also an outcome of a recommendation in a Paine-Fenton report, has been endorsed by some officials who feel that some specific to do about it. To avoid all the complex problems being introduced by internationalization. As of late last week, the committee had not chosen a consultant firm to handle the task.

► **Domestic transocean traffic continued to decline in July while worldwide ton miles rose 2% to pull the industry's record load factor to one of the lowest levels in recent years. Passage revenue rates for the month dropped 1.5% to \$2.66 billion. The industry had registered passenger revenue index gains in only two of the past nine months. Available seat miles increased 10% during the month to reach a record high of 876 billion. Load factor, which has dropped steadily virtually every month since January, improved even after service to whitelisted numbers, fell to 16 percentage points to 55.75%. Available load factor has moved above the 50% mark in only one month of the last 10.**

► **Radio height displays and wind correction systems will be installed at 180 New York and La Guardia airports by Intermountain Electronics Corp. to provide pilots with radio weather information. Systems will display cloud formations and general weather conditions up to 250 mi from the New York airports.**

► **Watch for TWA to show serious interest in the General Electric CJ-855-25 all-fan engine for its prospective Convair 880 order. Since the order has been delayed (AW Aug. 14, p. 12), the GE engine becomes competitive on a time basis.**

► **Eastern Air Lines** will introduce various innovations within the next few months designed to improve scheduling and generate a higher volume of domestic traffic.

► **Air Transport Assoc. and the National Economic Assoc. have developed a program which will enable U.S. airlines to register speed records set on regularly scheduled flights with the Federation Aéronautique Internationale. At present time, there are no official speed records of U.S. airlines reported with FAI, although five foreign flag carriers have appeared recently on file, including Quebec Empire Airways with the speed record between San Francisco and New York.**

► **Federal Aviation Agency** is studying the potential of the helicopter as an aircraft for rescue work. Agency is showing interest in the Kaman H-43-H Huskie for this purpose.

► **Seat capacity of International Air Transport Assoc. members rose 47% during the second quarter of 1961 over the same period last year on North Atlantic routes. Total number of passengers declined only 4.5% in the same period resulting in a 20.5 point drop in load factor. Economy-class passengers accounted for 50% of all traffic. Of the 380,277 passengers carried on the route during the three-month period, only 72,277 flew first class.**

► **Washington Helicopter Helicopters**, an applicant with the Civil Aeronautics Board to provide scheduled helicopter service in the Washington area, now has a paid-in capitalization of \$1,500,000. Contract and charter service has been started with a Bell 47H helicopter.

► **United Air Lines** passengers flying between San Francisco and Los Angeles to overbooked first class or other seats that the carrier has installed a spiral in a series in the forward galley which dispenses folded, prepared meals. And since most passengers sit for a second meal during the flight, two waiters are automatically served each customer.

Cuba Returns Electra; Right to Search Asked

Washington—Eastern Air Lines, Inc., the Cuban government last week after an exchange of diplomatic notes and the return by the U.S. of a Cuban patrol boat attached by a U.S. firm for non-payment of debts.

Congress, meanwhile, continued its press for legislation aimed at averting further legal disputes while the two nations strengthened security measures and sought Civil Aviation Board authority to subject suspicious passengers to personal search.

Impounded at Miami since its July 24 departure by a Miami winter, the four-engine turboprop airplane is to be returned "immediately and conditionally" in a 30-day Eastern time which flew the aircraft to Miami after a thorough inspection. Very few replacement parts were needed. The Electra was started by a mobile ground test stand in Cuba. Havana transportation officials said the Electra would undergo a more searching examination in Miami and probably would be repainted in scheduled revenue flights next week.

The Cuban patrol boat was released after the Havana Advertising Agency of Miami agreed to let it go "in an effort to demonstrate national unity." The agency has leased 10 Cuban aircraft and said one of them under a federal order had been granted because of unpaid Cuban debts.

President Kennedy recently signed executive orders dealing with licensing requirements and pointed out that more than 25 Cuban aircraft have been brought to the U.S. by declassifying four-tenths of the aircraft that have been detained and since sold.

Joint Commerce Committee members have reported out their version of a bill on licensing, which is expected to be presented on the House floor this week. The bill is more detailed than a version passed by the Senate but both carry a minimum 10 percent for the

MEA Cuts Tie

London—British Overseas Airways Corp. has agreed to sell its 99.9 percent interest in Middle East Airlines in MEA for \$4.1 million and the London-based company is making arrangements for repayment of about \$8 million in loans.

Funding has been undertaken by a group of London banks. MEA has been a BOAC-associated company since 1954 and her year showed a profit. Pending agreement between the two airlines will continue, according to Sir Michael Shattock, BOAC chairman, and Sir Leslie Newbold, MEA chairman.

Agreement also provides that could impose a death sentence if dangerous weapons were found. A joint committee would be needed to serve as a tool acceptable to both countries.

Meanwhile, the Civil Aviation Board granted Eastern Air Lines, National Airlines and Midwest Airlines permission to ask passengers to submit to a personal search in cases where the airline suspect weapons are being carried.

Other airlines were expected to accept the same authority to protect themselves against most actions that might result from the screening.

TWA Completes 707 Finance Arrangement

Twa World Airlines completed arrangements last week for sale of \$107 million in 60% equipment financing bank notes to institutions and \$40 million in 10% equipment notes given to banks to finance purchase of 10 Boeing 707-33B and six 707-33B turbofan-powered transports.

The agreements followed those the airline said TWA had final say against British Airways and Hughes Tool Co. offering interference with the airline's effort to complete the 707 financing (AW Aug. 14, p. 47). Changes that TWA sought placed no impediment to completion of each transaction and considerably with the original plan.

TWA and there were no connections between the filing of its suit and the completion of the financing. Generally the same group of institutions and banks participating in TWA's earlier air financing last winter also are participating in this one, although at reduced rates 5.5% lower. Dillon Read & Co., Lazard Frères and Lehman Bros. were the investment bankers capturing the agreements.

Grace Denies Any Plan For Panagra Merger

Washington—Cuban authorities announced that a merger between Panagra and Cuban Airlines will be a major outcome of the forthcoming Civil Aviation Board investigation of South American routes (AW Aug. 14, p. 47) if being called overboard by W. H. Grace & Co., which holds a 10% interest in Panagra.

Grace last week, and it would oppose any merger and claimed that the Board failed to take into account the negotiations did not suggest, even by implication, that the Board would seek a merger between the two enterprises in a series of assessing the South American route problem.

In its order the Board said it had tentatively concluded that South

American should be served by a West Coast and East Coast route from U.S. gateways, either by a single U.S. carrier or by two carriers, three U.S. carriers—Pan American World Airways, Panagra and Board-passenger rights services to points in South America.

The Board specifically stated in its order that "power granted the Board . . . do not include authority to compel anyone, or to terminate the entire route of a carrier." However, the Board can exercise its power over the economic stability of any carrier by strengthening the rules of use to give it a competitive advantage over the others.

The investigation was undertaken to determine whether the public convenience and necessity requires that the Board should terminate the certificate or certificate of air waybill of "all of the three carriers in order to implement the route pattern proposed by South American."

Swissair Plans 380 Far Eastern Service

Zurich-Swissair is scheduled to begin jet service to the Far East on Sept. 15 with two Convair 990 transports on lease pending the arrival of the long-range Convair 990s on order.

Convair 990s are late, however. Convair says to be in Europe by late next week. Before being shipped, they will be used for crew training from Stockholm via Arlanda Station's Nichols Airport near Stockholm. Practice of flight crews will be made at training firms in Zurich.

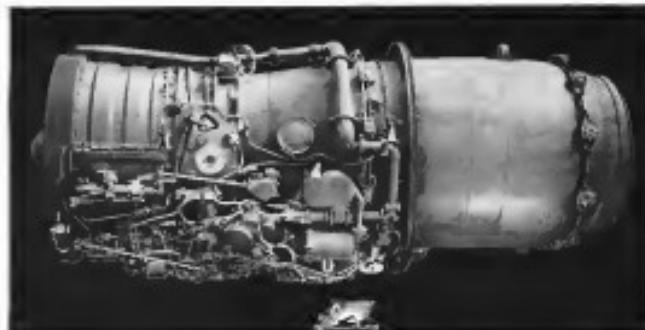
EAL Deficit Traced To Engineers' Strike

Eastern Air Lines last week announced a net loss from operations of \$6,382,000 for the first six months of 1960. Operating revenues for the period were \$147 million. A 2.3% increase was in same period last year, but operating expenses increased 7.7% to \$137.9 million.

The airline said that the application of a special credit of \$3.3 million after taxes representing overhead reserve no longer required due to the changeover to a continuous maintenance system resulted in a net dollar charge of \$1 million to current surplus in the period. The airline's operating loss was primarily due to a loss of approximately \$6 million in revenue caused by the strike of flight engineers in February together with general business conditions affecting the entire industry, Eastern said.

Eastern held its available seat miles during the period to a 15% average while revenue passenger miles fell a slight 0.1%.

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THE JENNY VS. PANCHO VILLA

LEACH HERITAGE OF THE AIR — 14

Blinded by stinging sand, the angry Mexicans crossed raised shotguns. The American Indians, leading snipers as the two planes took off. Minutes before, the Mexicans had shelled the village of San Pedro and burned holes in the fuselage of the second ship with machine guns.

Seconds after takeoff, one of the Jennies was in trouble. The top section of its fuselage blew off, damaged the vertical stabilizer and forced the pilot, Lt. Herbert A. Dargan, to land. As his comrade, Lt. E. E. Carberry, landed a short distance

away, Mexican military guards hurried to protect the downed Americans from another incoming mob. By 8:30 the next morning the damaged Jenny was repaired and both planes were heading back to their base at Casas Grandes.

It was April, 1916. At the height of the Mexican Punitive Expedition against General Francisco "Pancho" Villa, the Jennies had completed a mission to deliver important dispatches to the U.S. consul at Chihuahua City in northern Mexico. Capt. Benjamin D. Fodder, the Army's first aviator, flew with

Dargan; Capt. Townsend E. Dodd flew with Carberry. As a sideguard, each of the senior officers carried duplicates on patches.

The punitive expedition, led by Brig Gen. John J. Pershing, had been ordered by President Wilson immediately after Villa's 165-mile assault army had pillaged the town of Columbus, N. M., 50 miles from El Paso. The First Aero Squadron at Fort Sam Houston, equipped with eight service-type Curtiss JN-3 training planes, was sent into action in March — two months after Fodder had married 19 American passengers in a train holdup near Chihuahua City. The squadron's Captain, Franklin C. Owsley, joined Fodder's forces at Casas Grandes to begin the first reconnaissance flights over Mexican territory. By early 1917, Jennies from the First Aero Squadron had flown 500 sorties covering 10,000 miles. In August, the squadron left Ensenada to return a notable World War I恩塞纳达战役。

The Curtiss Jenny was the most important training ship of the war ... and the greatest Jenny of all was the JN-3D powered by a 95-hp Curtiss OX-5 engine coddled in sheet aluminum. It had a top speed of 75 mph at sea level and a rate of climb that averaged about 2,000 feet in 10 minutes.

More than 4,500 Jennies were manufactured for American forces during World War I by Curtiss and seven other manufacturers. Hundreds more were produced in the United States and Canada for the English and British Empires air services.

Large government stocks of Jennies were cleaned up shortly after the Armistice at sacrifice prices as low as \$50. Jennies by the hundreds appeared all over the country.

In the postwar years, the Jenny became the first plane to be a regular aerial schoolbird and was the first aircraft readily available private plane. In the hands of skilled pilots, the Jenny earned the title "Queen of the Barnstormers."

Heritage of the Air

One of the most inspiring chapters in the history of technical evolution is the story of the man and flying machine of World War I. It is the highly personal story of brave men — and the wood, wire, bone and malleable tools they used that converted manpower to horsepower. Today, Leach Corporation celebrates its 10th year in electronics with the presentation of this Heritage of the Air series.

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Technical Director for *Heritage of the Air*: Lt. Col. Kinnibrough S. Strode, USAF

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Self-Focusing Antenna Arrays Developed

By Barry Miller

Los Angeles—First approaches to antenna system design which combine a new type of antenna called a self-focusing or adaptive antenna array, capable of quickly seeking and locking onto and then automatically tracking a signal source, were demonstrated recently at Lockheed.

The approach may provide the very high gain (perhaps as much as 70 dB) needed for applications as receiving video signals from interplanetary space probes.

The technique involves the use of phase-lock loops, or electronic sense systems, which have been used extensively in space telemetry systems. In a self-focusing signal the phase on elemental antennas *in situ*, as signal voltages picked up by each element can be added coherently while the beam is solidly steered. While conventional antenna arrays tend to accomplish the same task, they require some type of programming to compare the phase signals between all elements for steering beams of different directions and locations.

The general antenna design approach has been under study for the past two years in separate, independent efforts by two companies in separate units of the company. Recently both established the feasibility of the self-focusing antenna concept in laboratory simulation. The two organizations are the Surface Antennae Division of Space General Corp., Santa Barbara, Calif., and Space-General Corp. of Glendale, Calif.



ARTIST'S CONCEPT of a new type of parabolic antenna as part of the Athena concept (left). The dual-diameter electronic scanned array which can provide high antenna gains needed for deep space communications.

Space-General is a new corporate entity (AMM July 16, p. 78) combining Aerojet's Spacecraft Division with Space Electronac Corp., which has conducted the adaptive antenna work.

Antenna Time Factor

Aeronautics' basic idea of the phase-lock loop—first at the time it takes to lock and lock onto a target and to lock and to lock onto a target are important factors of a system. The company's engineers indicate that when high gain is achieved, the required phase-lock loop technique will supply and at considerable less cost than a gain of about 60 dB is required. Aeronautics' gain in excess of 70 dB, they say, with conventional techniques must take plus 1 dB, the acquisition time of the phase lock down is no greater than 0.6 sec, as compared with about 0.7 sec for the non-coherent array. Because the phase lock system is adaptive, it can acquire a source more rapidly for higher level signals, Gang says.

The conventional array, he points out, has a fixed aperture size for signals equal to or greater than the minimum size detectable by a conventional array. In addition, he says, the photons return over longer ranges below the minimum of the available signal although it takes a longer time.

Other advantages of the phase-lock loop antenna seem, cited by Gang, are that the array is:

■ Adaptive in changes in signal level and noise spectral density

■ Capable of using the incoming signal to self-align itself and electronically calibrate the antenna more often.

Study Support

Phase-lock loop antenna studies have been supported by several government agencies. One was a joint study which was sponsored by the two small contractors one from the National Aeronautics and Space Administration's Jet Propulsion Laboratory, the other from Air Force Cambridge Research Center. The former contractor called for an investigation of the requirements and feasibility of an electronic, self-focusing, tracking antenna system while the latter acquired a laboratory simulator to demonstrate the results of the former.

Gang's work has been supported under a continuing Air Force study from an agency the contractor declined to identify but which is believed to be Rome Air Development Center. The company says it believes the most promising application for the Athena technique are microwave communications, tracking, imaging, high definition and trading, communications with both

antenna elements or phase differences among them varying between antenna elements changes.

Spatial refers to its phase-lock loop array by the name Athena for Adaptive Three-dimensional Electronic Scanned Array Studies. The company's engineers indicate that when high gain is achieved, the required phase-lock loop technique will supply and at considerably less cost than a gain of about 60 dB is required. Athena's gain in excess of 70 dB, they say, with conventional techniques must take plus 1 dB, the acquisition time of the phase lock down is no greater than 0.6 sec, as compared with about 0.7 sec for the non-coherent array. Because the phase lock system is adaptive, it can acquire a source more rapidly for higher level signals, Gang says.

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■ Adaptive in changes in signal level and noise spectral density

■ Capable of using the incoming signal to self-align itself and electronically calibrate the antenna more often.

In addition there would not be any problems with aging of phase shifter or

High-Gain Antenna Functions

Communication over planetary distances with space vehicles which do not have maneuvered amounts of power at their disposal and whose antennas are located in one place a heavy burden on ground-based tracking antennas. This requires more information (high bandwidth) to support the Athena and Venus, mentioned with high gains—on the order of 60 dB—can be done according to engineers at Sperry Gyroscope Co.

Antenna gains—a measure of how well the antenna pattern radiates from a single direction over a large area and focuses on a similar antenna as received in a number of ways. These include:

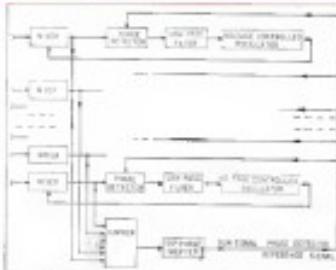
■ Reflector antenna (parabolic dish). Reflector's shape makes the length of all paths from the radiating source to the receiving point or focus equal. At the focus, radiation from all portions of the dish feed is in phase or coherent with radiation from other portions of the dish.

■ Reflector antenna (elliptical lens). Equivalent free space path lengths of all paths are equalized by causing waves to travel in same portions of the path at less than the velocity of light in free space. Rays are bent or focused to a single point, or reflected out along axis to longest side of the dish.

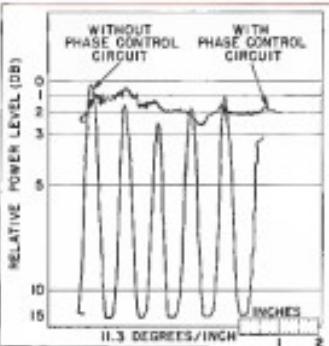
■ Reflector antenna (lens). Antenna is composed of lens and lens supports. Lens is an array of individual areas of current. Lenses phase shifts provided by mechanical or electronic phase shifter. The effects are low order. Individual signals pass through different sections of the lens can be delayed by a precise amount and then added coherently. The lens's lenses is the main practice at which delayed inputs are added.

Each antenna type has its own peculiar problem as short ranges when required for sun and track operations, according to Dr. Arthur Gruen of Space-General Corp. Among these, he cites the relatively long time needed to acquire a suitable source, the probability that a false indication of source direction will be given if the source is acquired on a side lobe, the high degree of nonlinearities present in reflecting devices in the need to program an antenna with some type of computer and the relative difficulty of the control system.

Different techniques can be used to reduce the need to look in different directions. Parabolic reflectors at their feed point can be moved but the costs of moving joints required impacts funds on search times. Or the beam can be modified between a



BLOCK DIAGRAM of Space-General's self-focusing antenna array as it is reported to be suitable for searching and tracking (above). Pictures of two horn antennas (right) show (top) an input obtained with and without closed loop phase control circuitry in tests on C band model at Sperry Gyroscope Co.



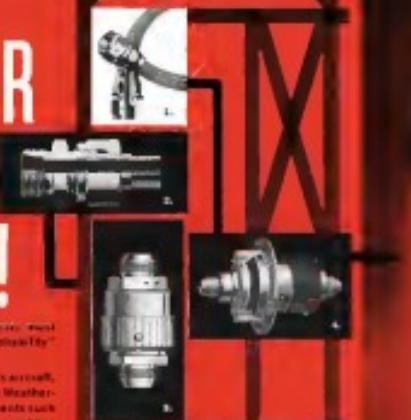
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ROCK DISCONNECT COUPLINGS

Self-centering
Positive locking
Stainless steel
stainless steel



LIQUID INJECTION

Stainless steel
stainless steel



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active and passive satellites, other forms of space communications and space probe research.

Operation of the tall antenna arm cannot be illustrated by an intermediate block diagram (page 35) of what Space-General calls its active adaptive antenna arm system. At left receiving signals picked up by the elec-

trical antenna in the arm, are mixed with signals from voltage-controlled oscillators.

Only two of many possible channels

are shown in frequency and phase by the signals from the passive detector until the signals from the mixer are all in the same frequency and phase, the control signals are removed.

These signals are then added in a summing network.

Voltage controlled oscillators consist of an average zero voltage frequency, and then cause the above phases of the input signals. In this way, phase shifts introduced by different path lengths are adjusted automatically by three oscillators.

High-Speed System

Because the system is electronic it can be made very fast. Speed of operation is determined primarily by the time constants of the bandwidth of the low-pass filter preceding the voltage controlled oscillator. The bandwidth of the system is governed mainly by the ratio of signal strength to noise spectral density.

According to Space-General, adjust-

ing plants automatically by phaselock loops.

• Spacing between elemental antennas is 10 times the wavelength.

• Extraneous elements which introduce extra elemental extrema by being end or other modes do not degrade the narrow beams.

• Source cannot be separated on a side lobe.

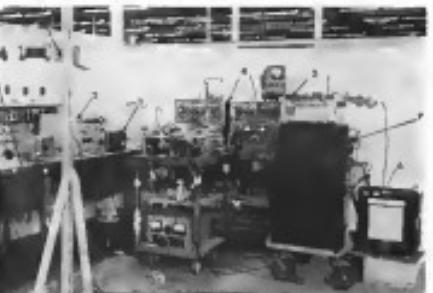
• Spacing between elemental antennas need not be known recently.

• Phase shifts need not be calculated as they must be in a conventional at open-loop arms.

• System changes in bandwidth in response to the signal levels, i.e., for large signals, even though the bandwidth of the system does not change, giving changes in operation times. But the system can be designed to automatically acquire signals of any level in the shortest possible time. It is this property of the system—the ability to shorten acquisition time based on signal strength variations, thereby increasing bandwidth—which makes the system adaptive.

System can also be made adaptive to changes in noise spectral density. This is accomplished, Space-General says, with bandpass filters at the output of the mixer. These devices can maintain the same signal-to-noise ratios in their outputs in three ways. They have constant gain, or constant noise.

These relations enable the output signal to be effectively constant for high signal-to-noise ratios. When these ratios are low, output signal power is proportional to input signal/noise ratio. As discussed in the noise spectral density



SELF-RELOCATING ANTENNA test model in laboratory at Sprague Company Co., Great Neck, N. Y. was employed at establishing feasibility of electronically relocating phase differences of elemental antennas so they can be added coherently. Equipment includes transmitting antenna (1), signal source (2), reference oscillator (3), power supply (4), phase-lock antenna (5), dual oscillator (6), R.F. shielding material (7) and phase-locked loop (8). Tests were conducted at 5,000 mc. R.F. band.

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with input signal power constant will give a smaller output voltage than lowering the gain of the preamplifier system and in turn reducing the bandwidth of the phase-lock system. Hence in the phase-lock loop bandwidth, a fairly constant signal-to-noise ratio will be maintained when the noise spectral density increases. This means, Space-General says, that the system will integrate and track the source signal. The rate phase error in the voltage controlled oscillator will not rise when the noise spectral density increases, the company says.

To demonstrate the feasibility of the phase-lock loop system, both companies have built laboratory bench-models. They differ in that the Sperry model was a two-loop system operating at 100 Hz while the Space-General model was an eight-loop unit at audio frequencies.

The Sperry model consisted of two phase-locked loops connected to operate equal wingload relatives several wave lengths apart. A third horn was used as a target or source. With the loops disconnected and the source horn disconnected, the open-ended horns were phased and the two signals (the loops were externally synchronized according to the approach) A grating-like pattern was cast on the signals as the two center horns rotated in and out of phase.

Then the phase loops were connected and the gain was shown to be substantially constant over the entire angle of the wave. Deviations were attributed to reflections from metallic objects in the indoor test facility.

A transmitter was also mounted in the Aibus locked horns by means of an isolator and offset air frequency about 100 cps from the normal signal used to lock the phase loops. A receiver was connected to the target horn and a pattern was taken with and without the Aibus loops operating.



Lockheed Antenna

Six-foot diameter satellite tracking antenna at Lockheed's New Boston, N. H., facility is used in connection with company's Defense, Manned and Space satellite programs for the Air Force.

Control and Instrumentation Engineers

A key research and development program is now underway at Atomics International to design long-life, compact, lightweight nuclear reactors that will provide auxiliary power systems for space applications. Many interesting problems exist to challenge electrical engineers who want to relate their present experience to reactor technology in any of the following areas:

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Electrical control systems design and/or aircraft or missile flight instrumentation design. Will establish flight instrumentation requirements, block diagrams for flight and test systems, preliminary specifications for each instrument or subsystem.

TELEMETRY

Responsible engineers to analyze, plan and specify the telemetry required to ascertain the performances of nuclear power plants during space tests. The individuals must have experience in missile instrumentation and telemetry of temperature, vibration, acceleration, etc. BS or MSEE preferred.

CONTROL ANALYSIS

Dynamic and control analysis including system start-up and full power operation. BS or MSEE plus familiarity with latest analog and digital techniques required.

CIRCUIT DESIGN

Electrical engineers experienced with both vacuum tube and magnetic devices to design and develop control circuits for compact nuclear power plants.

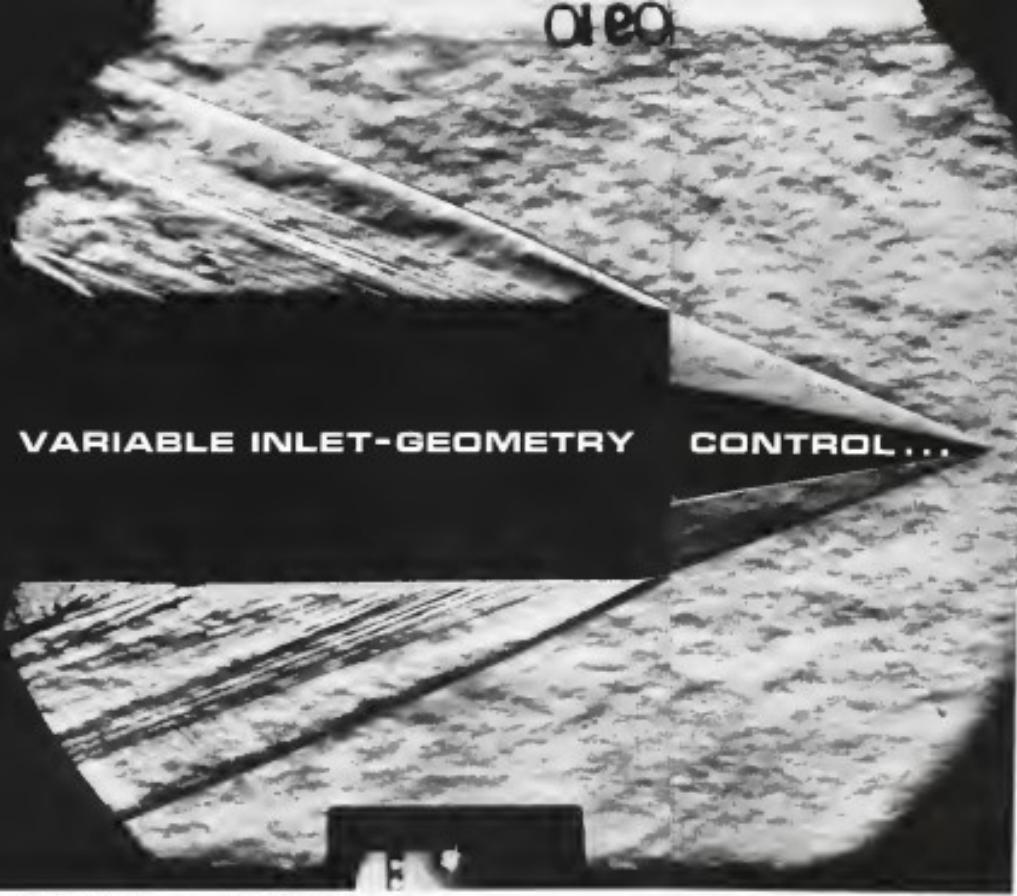
All qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

For specific details write: Mr. G. U. Newton, Personnel Office, Atomics International, 3800 DeSoto Avenue, Canoga Park, California.

ATOMICS INTERNATIONAL

DIVISION OF NORTH AMERICAN AVIATION





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For flight above Mach 2, effective control of inlet pressure recovery is indispensable to aircraft performance and safety. Primary control depends on an optimum variable-geometry duct design. But because of the wide range of air-speeds and densities encountered, precise, automatic control of the inlet geometry is vital. A comprehensive inlet control system is, consequently, an essential design consideration. Through its ability to reliably sense, compute, and correct for extreme environmental forces, an accurate variable-geometry control system can assure ideal inlet pressure recoveries through any flight regime.

Hamilton Standard has already designed and developed complete inlet control options which fulfill these requirements. These systems, for future aircraft programs, incorporate such advanced control devices as...

*key to the
high Mach
airplane*

- a Mach sensor with a response time of less than 30 microseconds, accurate to $\pm 1\%$ of temperature up to 400°F.
- a compact diaphragm hydromechanical subsystem which controls pressure ratios in ambient airflows above 1000°F and loads with air loads with a hydraulic actuator requiring as little as 30 HP.
- a logic sensor which effectively distinguishes between normal transonic pressures and abnormal pressure anomalies.

Hamilton Standard advances in variable geometry controls are a direct evolutionary result of the company's work in—hydromechanical, electromechanical, pneumatic, and hydraulic systems—for aircraft past and present. These technologies form a ready pool of design and developmental ability for meeting future ultra-high Mach requirements. Your inquiry is invited.

SCHWARTZ P86310: a shock wave pattern at Mach 2, taken by Actual Aircraft Corporation supersonic wind tunnel—part of several advanced test sites used to develop Hamilton Standard variable inlet geometry controls.

UNITED AIRCRAFT CORPORATION
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ADVANCED CONTROL SYSTEMS



The first fleet and to receive the new AJ-2 Vigilante attack bomber is U.S. Navy Heavy Attack Wing #1 (HATWING #1). The AJ-2 is the most versatile Mach 2 weapon possessed by any navy in the world. Whatever the mission—at high or low level, from carriers or small space airfields, day or night, in any weather—the AJ-2 can carry out its duty promptly and effectively. It was designed and built by the Columbus Division of North American Aviation.

THE COLUMBUS DIVISION OF NORTH AMERICAN AVIATION
Columbus, Ohio

Space Guidance Methods Detailed by ARS

By Philip J. Kline

Stardust, Calif.—Automatic star trackers for space vehicles attitude control and rendezvous guidance, expected to achieve star position with an error of less than 10 arc sec of arc, are reported here during the recent Goddard, Convair and NASA-Aerospace Conference sponsored by the American Rocket Society and Standford University.

The new 25th tracker, designed to locate and lock onto stars of ninth magnitude and brighter within a 90 deg field of view, is being developed by General Electric's Missile and Space Vehicle Department. Dr. B. R. McMonagle said. The device is expected to be operational within several months. McMonagle told *Aerospace*: "We expect power consumption is expected to be less than 25 watts."

The more than 500 engineers and scientists who attended the conference also heard reports on the following:

- Use of angular accelerometers instead of gyro for ballistic missile navigation stabilization. An electronic stabilizer oriented by bending the deflection of the missile has been devised. Walter R. Baatz and Joseph P. Higley proposed the use of variable planar acceleration whose signals are weighted according to vehicle mass distribution, thus added to provide a direct measure of the force and torque acting on the missile which is independent of bending mode deflections.

- Recent advances in cryogenic gyro techniques suggest that "we can have a larger gyro within a few years," let Propulsion Laboratory's John T. Hawling said. IPU's cryogenic gyro effort has been directed at researching basic problems associated with attempting to build an experimental unit, Hawling said. Measurements show that the gyro ball accelerated from 99.7% zero-g velocity and stopped in a cylinder of 0.0001 m. showed a total torque due to unbalance exceeding twice maximum fly of about two dynes-centimeters, with torque due to trapped magnetic flux of about 100 dynes. Hawling said IPU is investigating use of a light weight rotor made of aluminum which is vapor-coated with a superconductor at room surface, he added.

- Inverted bellows type drag bridle, whose braking area can be varied (zoomed) appears to be an attractive means for providing many control functions for providing many control functions for maneuvering and landing. Aeronautics Research Center's Avon W. E. Van der Velde and J. E. Hays reported. The drag bridle can be used to orient the vehicle while in flight, stabilize an reorient, and control the vehicle's landing point accurately. Additionally, the drag

bride can be used to dissipate energy by moving at a large radius, the ARS scientists reported. Because the drag effect will vary over wide angles due to congealing variations in air massflow density at different altitudes, the expandable bridle would be controlled from signals provided by an accelerometer on the vehicle to give the desired amount of deceleration of the vehicle during descent. To provide proper control, the accelerometers would need to operate over a 2,000 to 1 range of reference usage. Arvel's research in expanded drag bridle was sponsored by USAF's Astronautical Sciences Directorate.

- Retinot with a "memory," called a "memistor," suitable for use as an integrating artificial neuron except for use in self-learning control systems was described by Benson Wobus, Electro Engineering Department, Standford University. The memistor at a time

annual device in which the conductivity (resistance) between two of its terminals is a direct function of the temperature of the current in the third terminal, other than the instantaneous value as for a transistor. The device consists of a conductive substrate with insulated connection leads and a metal wire mesh, or an electrolytic plating bath. Movement produced to drive have a resistor which is connected in series with the memistor through a 100 ohm resistor for a time interval of about 50 seconds with the application of several milliamperes of plateau current. Wobus said. At present, memistors are made by driving silver until it is melt carbonization so that a fine granular surface is obtained with resistor connections exposed. Light coats of shadow provide a smooth substrate for plating and protect the copper lead connections. These connections are insulated and the resistors are sealed in individual rooftop package baths in polycarbonate only. Improved techniques and configurations for making memistors are now in investigation, Wobus said.

- Optic fiber system for measuring linear velocity or velocity by measuring rotation shift of rotation was the subject of several papers at the conference. R. G. Franklin and D. L. Bass of Franklin Institute Laboratories for Research and Development said that changes in reflectivity of an optical fiber around had been measured in the laboratory, using template spectroscopy and that it may be possible to increase this sensitivity by a factor of 1000. A most attractive technique for measuring Doppler shift of sunlight, suitable for monitoring velocities as far away from 1 to 1,000 kilometers, is the use of optical heterodyning possible with optical masers, the authors suggested. A system using optical heterodyning was demonstrated, consisting of the detection of the difference between the signal at a high-frequency receiver and microwave stabilized wave problem. The Franklin Institute studies were sponsored by USAF's Astronautical Sciences Division. R. N. Norton and B. L. Wilder of Jet Propulsion Laboratories were less optimistic over the possibility of just an optical Doppler system. Their investigation of line-broadening and shifting mechanisms as stellar absorption (backscattering) that surrounded the sun, indicated that a variability of about 200 fpm may be expected in an observer's measured optical Doppler shifts, in addition to errors or limitations of the instruments used. It is this which imposes a fundamental limitation on the accuracy of a stellar Doppler velocity system,



Remote VOR Beacon

Standford Telephone & Cables, Ltd., is studying the VOR beacon design for automated, remote controlled operation in three versions, 30, 100 and 300 watt. Beacon is in three versions, with 100-watt distance. Middle version, which has 12 eighth spaced vertical slots, has a resonant cavity and also forms the reflecting surface of the horn. Transmitter and antenna assembly as well as absorption (backscattering) that surrounded the sun, indicated that a variability of about 200 fpm may be expected in an observer's measured optical Doppler shifts, in addition to errors or limitations of the instruments used. It is this which imposes a fundamental limitation on the accuracy of a stellar Doppler velocity system,

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WIREWOUND POTENTIOMETERS



Small Telemetry Unit

New USAF Douglas telemetry system for craft research rockets, weight only 12 lb including 7 lb of batteries. System developed by Space Electronics Corp., is expected to achieve ranges of at least 200,000 mi using 1-watt transmitter through use of extreme efficient digital coded transmission. The smallest satellite-phase-modulated transmitter fully transistored and weighing 7 oz, is made by Vortex Manufacturing Co. System's first flight will be aboard a USAF Blue Scout Jason rocket later this year in summer addition to space.

refine three instrumentation, the author believes.

• Pathadaptive guidance mode, developed for the Sigma nose-cone vehicle to accommodate loss of one or more engines during flight, and to provide greater latitude of launch base for difficult space missions was described in two reports by W. E. Young, D. H. Schleicher and N. J. Bond, all with the Corps. C. Marshall Space Flight Center. In the pathadaptive guidance mode, a digital computer aboard the vehicle will compute the local inertial vector alignment required for the optimum path from the launched vehicle coordinates to the desired mission coordinates based on the received parameters, position, velocity and time. It also allows the computer to correct the measured thrust vector direction and the computed value.

• Attitude control of space vehicles using earth's magnetic field, for reducing weight. Magnetic payloads were of mass-suspending systems for damping angular accelerations was described by A. G. Buckham of Washington Doctor's Air Arm Division. Vehicle would be equipped with three mutually perpendicular coils for measuring orientation and thus mutually perpendicular to each other for strong moments and generating desired angular rotation. Unloaded moments stored in memory which (from previous maneuver) would be measured by inductance generation driven from the shield to obtain liquid performance by computation of orientation. A magnetometer would

measure components in this artificial direction of the earth's magnetic field. A simple analog computer could then determine how much current must be supplied to each coil to develop required counteractive torque torques for vehicle operating at altitude below approximately 40,000 mi, where no operational life of more than seven weeks is required. The electromechanical system developed is lighter and occupies less volume than mass-suspending avionics, Buckham said.

- Passive stabilization of space vehicles in highly eccentric orbits by an earth vertical will prove extremely difficult due to the complex kinematics of the problem, Dr. Paul H. Scott of American Bosch Aero Corp. reported. His analysis indicates that the vehicle will oscillate at three different frequencies. Schelke frequency of the forcing function (inertial) frequency within the orbital plane and a natural response precession in the orbital plane.

- Solar radiation pressure is another source of perturbation for space vehicles. R. J. McElroy of the Space Technology Laboratories and Research Co. of El Segundo indicated that solar radiation pressure can produce torque that is either periodic or constant with respect to orbital plane, depending upon the orbital inclination of the vehicle, relative to the ecliptic plane.

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Flip-Flop Circuit

New integrated flip-flop circuit, consisting of 12 interconnected components enclosed in silicon oxide film and mounted on ceramic substrate measuring 0.37 x 0.31 as available for use in ATEC/ARCA Micro Modules, is now available from General Instrument Semiconductor Division. Each flip-flop consists of six transistors, two resistors, two diodes, two capacitors, two internal phase-shifting resistors and two interdigitating photo-masks. Components are die-enclosed by gold-pasted circuit. Device is called a "monolithic." Company's address is 69 Governor St., Newark, N. J.

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Tab-Indicator
Toggle
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 Five models available in sizes 1, 2, 3, 4 and 5 pole
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The new "TS" Series Toggle Switch from MICRO SWITCH has a paddle shaped tab which can be numbered or color coded in six colors. The standard model has a natural metallic finish which will receive a finish appearance through long and continuous. The anodized aluminum tab is also available in black or silver.

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Five models are presently available in the "TS" Series, including both normally open and normally closed contact types. Write for Data Sheet No. 174 describing these new tab-indicator toggle switches.

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Precision Toggle Control Can Be Customized

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A legal binding precision switch. Wide choice of contact arrangements includes 1, 2, 3 and 4 pole types.

Subminiature "TM" Weight only 415 grams, measures only 1 1/8" x 1 1/8" in the base. Double pole double-throw with wide temperature range and low circuit resistance.

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There is a MICRO SWITCH branch office near you and prompt engineering help on the selection of toggle switches is available by simply checking the Yellow Pages. Be sure you get source approval pictures and reliability.

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BOSCH-COLEMAN COMPANY
Atlanta and Miami Avionics Divisions
Dept. 3, 1000 Bell Rd., Atlanta, Georgia

navigation requirements and the vehicle's configuration, McDivitt said.

*New approach to ground-air attitude control, designed to minimize propellant consumption yet provide stable control without need for air agitation was proposed by B. S. Geyland and W. N. Kafker of Space Technology Laboratories. The system involves pulsed sig- nals whose duration is the measure of time of the propellant valve. The system controls vehicle attitude by pulse timing, allowing to control both roll and yaw during the start of a maneuver without failure by using photopulse quadrant illumination only. The knowledge of the quadrant is obtained by using the characteristics of the phase plane that an increasing error magnitude defines the first and third quadrants. That tells if the error is increasing or degrading, hence should control action be taken, the authors said.

FILTER CENTER

*USAF to Expand Maintenance Effort—Air Force Systems Command's Electronic Technology Directorate, which handled more than \$100 million in major technical programs in Fiscal 1967, began to expand its effort in the coming year. It developed over 100 under way this expected increase. Air Force may expand its technologies program in several hundred per cent during Fiscal 1968.

*USAF Divides Informed Responsibilities—Within the next 60 days, Aerospace Systems Command's Aviation Directorate will assume responsibility for guided missile systems at infrared detector Research Laboratories, will be responsible for infrared detectors as lead for use at wavelengths shorter than 1.00 microns, while infrared systems at longer wavelengths will be assigned to Navigation and Guidance Laboratories. Aviation Directorate's Electronic Technology Laboratory will monitor programs in new infrared detector materials

and develop VOR/Haz-Check, further above NVAs II, improved navigation receiver developed by Brooks Radar and Radio Division, which enables pilot to check its operation in flight. When pilot pushes two buttons, VOR/ICAO enter duplo station bearing of any degree if receiver is operating properly.

*UHL Computer Checks Autopilot—New digital computer has been developed by Technical Division, San Luis Obispo, San Francisco maintenance and base which can check digital performance of an automatic pilot in 30 hours or less. Previous static testing of autopilot required as long as 5 hr., and did not assure that autopilot would function properly in flight. Dynamic performance of airplane and unrelated airplane is modeled on a Bush analog recorder.

*New SHF Magnetron Developed—Voltage tunable backward-wave oscillator with a tuning range of 10.5 to 15.5 GHz has been developed by Systems under sponsorship of Electronic Technology, Lockheed, Denver. New tube provides approximately 100 watts of cw power output.

*High-Speed Movie Camera Developed—Movie picture cameras for filming and reading high-speed motion and simultaneously in color and black-and-white, recording single frame action at 20 half-frames of a second while taking one million frames per second, has been developed by Naval Ordnance Laboratory, Silver Spring, Md. New camera, 15 times faster than high-speed cameras now in use, according to NOL, was developed for Atomic Energy Commission to be used at Los Alamos Radiation Laboratory, Los Alamos, N.M.

*Infrared Radar Spots Reliability—Interest in control radar is high, says McDonnell F4H-1D, which recently broke previous transonic flight speed record by flying nonstop from California to New York at 27 hr. 48 min., not until reaching home on half by preparing location of AID aerial tankers, according to Westinghouse Electric, whose Air Arm Division developed the fire control system. New Westinghouse radar has greatly improved range over previous interceptor systems, the company says.

*Physiological Data Acquisition—A physiological data acquisition system which will gather physiological data from an instrumented man or change located in an environmental chamber at Holloman AFB will be built by Aerovox, Inc. System which can gather environmental as well as the physiological data will include magnetic recording device, analog-to-digital conversion gear and display console.

*Four subsidiary companies of S. Smith & Sons (England), have been assigned to four South African Divisions, with headquarters at Windhoek, Mafikeng, Cape Town and St. Andrews Airport, Johannesburg. R. J. H. Hughes, Dyson-Brown, Clegg & International, of Kelvin & Hughes (London) Overseas R. G. Gudgin, Smith, chairman; L. A. Morgan, chief executive; A. M. Maynard, deputy general manager; E. C. Harrison, chief technical director; and K. Ferrando, technical director. D. G. Johnson has been appointed chief technical sales executive.

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system for the B-52... shipboard fire control and navigation systems... anti-submarine warfare systems.

Arma's chief contribution to our national defense effort is the ability to deliver reliable systems—on schedule and within the budget. All research and development, engineering and production are based on that. Likewise, Arma, a division of American Bosch Arma Corporation, Garden City, New York.

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Precision potentiometers. AMF's Precision Instrument Plant is controlled by optical digital discs accurate to 0.05 microdegrees. It tracks mirrors and satellites.

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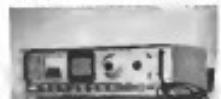
NEW AVIONIC PRODUCTS

• **Bentham - Temperature transducer, Model 1230.** For temperature, temperature/mass or moisture detection and switch applications at MIL-E-1273C. Transition resistance 10 ohms at 0°C x 4.814 m⁻¹, will provide continuous operation from -50°C to 1,000°F, and



can be installed with millivoltaged output basis. Resistance of platinum sensing element is 100 ohms at 0°C at 177°F. Manufacturer: Wixco Instruments & Controls Co., 11739 W. Pico Blvd., Los Angeles 64, Calif.

• **Voltage/phases converter, Model 3FN-480.** Converts voltage via ratio and precision rectifier for accurate measurement of phase shifts and voltage ratios. Self-excited and requires 54 ohms of panel real estate or can be employed



in portable test and has a variety of applications with ac signals in ranges from 15 cps to 100 kc. Load capacity is 10 ohms. Manufacturer: Aerometrics Division of North American Aviation, Inc., 9150 E. Imperial Hwy., Downey, Calif.



• **Mikro transducers.** Including models with infrared fiber winding design for differential input, polarized metal induction or other instrumentation. Current transducers made to specs as available. Manufacturer: Jones Electronics Inc., 600 No. Rosedale St., Chicago 15, Ill.



• **Micropoint, IBM-571.** A K-heat load pulse and dot anechoic cellular rotator, provides 100 lbs of peak power at a 0.001 duty cycle. Frequency range for the tube is 15.9 to 16.1 mc. Pulse duration is 0.08 to 1.2 microseconds. Input/output terminals may be connected to 10 pin Minature Connector. Manufacturer: Micropoint, Inc., Siletz Rd., Beverly, Mass.



• **Titanium potentiometers.** produced by chemical lamination of an oxide at high temperatures on a glass substrate, thereby avoiding wear with stepped resolution. Potentiometers have a solvent temperature range from -55° to +150°C, can withstand 10G shock and 70G vibration from 20 to 2,000 cycles. Temperature coefficient is 30 ppm/degree C. Manufacturer: Technics Industries, Inc., 30 Seaford Street, Santa Barbara, Calif.

• **Automatic resolution/analysis tester, Model COV-1801-01.** An automatically test 50 and 400 cycle resolution or resolution from 100 sec to 80 through 17. Tests surface, isolated quadrature resistor ($\pm 1\%$), load influence current ($\pm 1\%$), bidirectional null voltage ($\pm 1\%$), total null voltage ($\pm 1\%$), transmission ratio ($\pm 1\%$), error from electrical zero ($\pm 10\%$) and phase shift ($\pm 1\deg$). Tests over area up to 10 ft high, 97 in wide, 20 in. depth and weighs 1,000 lb. Manufacturer: Research Division, General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.

MANAGEMENT



FRITZ FREYTAG (center), technical director and chief designer of East German's Type 152 medium-range transport, briefs the West last October after East Germans lifted all nuclear programs. Photo was taken at time of 152 rollout in 1958.

East Germans Scrap 152s in Production

By Cecil Brownlow

BISMARCK-COFLA, Berlin—Fritz Freytag, chief of East German's VEB Flugzeugwerke Dresden plant, said in an interview a decision to discontinue all nuclear development and conversion to the production of such items as piston aircraft, prefabricated window buildings and industrial cranes. Completed prototype transport and passenger planes have been scrapped to the same scrap heap in one nondescript storage room.

West officials, however, pointed to growing resistance by East Germans hopes of developing a strong domestic industry and said also along with initial special testing that cannot be adapted to other purposes. Aeronautical engineers, an government under way during that interview, were asked to leave.

Some 150,000 square meters of office space in 200,000 m² union design, development and production units (AVB Mar. 27, p. 25) came at a time when seven prototypes of the Type 152 four-engine medium-range jet transport first took flight, much of the East German drive to gain international status in the aerospace field was moving ahead at an accelerated pace, and never more sophisticated models were on the drawing boards.

Compromises for a total of 16 Type 152s, for which a high and expensive industry had been built from scratch had been or were being fabricated at the time of the cutoff. The

second prototype, incorporating several design changes over the first, was following its flight test schedule and a third was under construction. Both were converted to the production of such items as piston aircraft, prefabricated window buildings and industrial cranes. Completed prototype transport and passenger planes have been scrapped to the same scrap heap in one nondescript storage room.

For aircraft production, the Dresden plant, which Freytag helped plan and build from the ground up, had two large 325-ft-long, cross-tunneling and rectangular shapes with coating in place and in operation at the time of the cutoff.

In the West, at least the program had seemed to get off to an auspicious beginning when the first 152 prototype was delivered on Mar. 4, 1958, during its second flight from Dresden after a series of tests had followed the initial trial the previous Dec. 4.

Freytag, however, attributes the reason for the cutoff for early 1959 to the Dresden plant's pilot error—a stall at altitude of approximately 1,000 ft above which the pilot was unable to recover—and major modifications to the second aircraft and first planned well before the accident. The prototype it self was a complete loss, exploding on impact at Freytag and his immediate vicinity from the plant.

The second prototype made its initial flight on Aug. 26, 1959. The second and last flight before Freytag left followed on Sept. 4. The flight test program, however, is believed to have continued in the time it was ordered to a halt by the government.

Moderation to the second prototype included a repositioning of the main landing gear structure and elimi-

nation of the auxiliary oxygen system located on each wingtip. In the first prototype, a hydraulically driven large craft extended and retracted like the center landing gear system with a forward-mounted hinge beneath the nose. In the second, the main landing gear was replaced by four wheels housed in enclosing fairings at a point at a point between the engines, as in the first Fertig prototype (AVB Mar. 21, 1960, p. 76).

While the prototype craft was cleaned up, its wingtip housing pods were retained, partially to avoid major design modifications that might have been necessary to prevent flutter had they been removed. This was adopted instead to the rule of my hands with each carrying approximately 160 U.S. gal of fuel.

The glider in one series for the navigator in the prototype—a freight version on Soviet design—was eliminated on the second model.

The third, with a 314-ft wingspan, high-wing was designed to carry a maximum of 75 passengers in an all-passenger layout configuration over a total range length of 1,200 mi. At maximum range without reserves was 1,065 mi. Cruising speed at 30,000 ft was 497 mph, increasing speed at 35,000 ft was 497 mph, decreasing speed at 15,000 ft was 572 mph.

Treibstoff at the minimum gross weight of 112,495 lb to max 141,000 lb. Landing gear at a gross weight of 77,750 lb to max 2,200 lb.

Possible Follow-ons

An airplane derivative to the 152, which development actually was begun by Freytag and other German engineers in early 1954 while they were still working in the Soviet Union, the Dresden plant had several new designs in the making—the most promising of them a twin-turboprop, low-wing, transport, renamed as a replacement for Russia's obsolescent piston-engine Il-34.

Most sizable design departure of the 40-passenger aircraft designated Type 155, was Freytag's plan to locate the two Pratt & Whitney engines as pods attached to the upper wing surface each at a height approximately 10.5 in. from the fuselage. Designers planned that the straight wing aircraft was 415 mph over a maximum range of 1,000 mi. Normal planned stage lengths were approximately 300 mi.

At the time of Freytag's departure, the aircraft was still in the initial stages. A nosecap had been built and between 200 and 500 detailed drawings had been completed—as opposed to the approximately total of 42,000 needed for the 152.

Earlier plans for a 70-passenger trans-oceanic turboprop required the 153 of about the same general size as the 152 and also using one of Pratt & Whitney powerplants were scrapped by Freytag.

After calculations showed that with one engine out and without counter-rotating propellers, the aircraft would always turn somewhat as if pulled into a spin by the torque of the working powerplant and thus roll into a steep, probable uncontrollable 40-deg. climb.

One of Freytag's running gopher was use of the question, Fixing and wave design and modification of the aircraft to make it more acceptable to the West German state that at the time the project was abandoned, however, until after 2,000 drawings had been completed and a number of wind and sea trials held to test out Freytag's the work. Proposed horsepower was the Pratt & Whitney 635 with 4,000 shp.

Another Freytag design under consideration was the Type 159, a medium range transport somewhat larger than the 152 and with greater range and payload capacity—estimated use of four Pratt & Whitney engines of 7,700 lb thrust each located in clusters of two, and above the engine on the rear of the fuselage with a pod mounted.

Design and actual assembly, including the completed 152s which were broken up for scrap at the time, have required less than several months after Freytag's departure when the East German government announced as abrupt halt to all aviation development activities in an effort designed to ease the upcoming blockade.

At the peak, the Dresden facilities had a total of 9,000 workers, 1,700 of whom worked on the 152 and Freytag terms the design program worked under by far can't be too bad. About 70% of the engineers were young Germans with an age mix of between 25 and 35 who had received their education in the Soviet Union, Dresden and elsewhere.

The effort, ranging between 40 and

consecutive days within the month. Officials of the plant, which had been blockaded back up from ground level since 1944 on a high prestige basis, were told that either this month and engine, which would basically provide a series of gliders designed to have an immediate impact upon the stagnating economy.

Private Production

Dresden, Freytag and Ludwigsdorf turned to the design and production of more prosaic aircraft with VEB Industriewerke Karl Marx Stadt, East Germany's third major aircraft factory. Improved versions of the Russian-designed Ilyushin IL-14T piston engine for the 50 U.S. ton load under license at Dresden between 1956 and 1959 were produced over roughly the same time span as at Kult-Mark-Stadt. Later, the plant turned to the production of other components for Dresden designs, including the 152's hydraulic system.

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The effort, ranging between 40 and



FRITZ FREYTAG (center), former technical director and chief designer of VEB Flugzeugwerke Dresden, explains his jet transport design to a group of East German officials during the visit of the second prototype of the new scrapped Type 152.

SOLID SUCCESS

On August 5, 1961, United Technology Corporation successfully test-fired the nation's first operational prototype segmented solid propellant rocket developing thrust in excess of 200,000 pounds. This major achievement is a significant milestone in the national program to develop multi-million-pound thrust boosters.

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LOW-SPIKE second stage at left had a maximum speed of 210 fps

In 1948, Badde worked on Germany before and during World War II, he had Freitag, a third project engineer at Junkers in Dessau from 1936 until his capture by the Soviets in 1945.

Overall the East German aviation industry had attained an employment figure of approximately 25,000 clients below the government staff, consisting in a moderate number of the country's industrialized industrial staff. In West Germany, however, which began developing its first jet aircraft in 1956 two years after the Soviet East German model but with a larger population and financial base to draw upon, had about 70,000 workers in a number of plants.

The agencies with which the East German government felt it had to divert this talent to other channels, and a probable indicator of the financial pinch it is facing, is evidenced by the fact that it decided to kill off the Type 132 completely rather than follow the program through at least to the point of delivering the five aircraft in hand or one completion to Deutsche Luftwaffe for use in peacetime assignment or inter-national flights to the West primarily, a major goal of the ministry during its term of non-aggression pact. Flying aircraft like the light jet program could have been completed for approximately \$400,000 each.

Engines Free

There apparently is no plan to name the industry, in its original role at arm's length within the now-East. A number of its engineers have remained or followed Freitag to the West. Most have been absorbed to bolster the technological efforts of other basic industries or diverted at their posts to other tasks.

Bernulf Badde, great allied credit for design of the 132 and Freitag's successor as technical director at Dornier is now in charge of a group of between 35 and 40 engineers engaged in the light design field in aerospace complete diversion from aircraft.

In the industry's prime, Badde, a former Junkers production engineer

sailed to safety at his home in Dresden near the Junkers plant.

The night November 1945, Freitag and eight armed Russian soldiers appeared one night at his home and proceeded to surround it. An interpreter asked, "Everyone leave much time? He needed to get ready to move to the Soviet Union with his wife and two children—a son now 20, a daughter now 17."

"I and, ah, about two weeks. The interpreter said two hours."

And, within two hours they were on their way to the Soviet zone where their belongings shifted into two American automobiles which the Soviets had provided.

Freitag's New Assignment

At the station they were assigned aboard a train, she equipped with Soviet guards and began the journey to Russia, that eventually landed them in the town of Podolsk about 70 mi south of Moscow on the Volga Canal, the site of a former U.S.-supplied weapons production and development base. For security, the production facilities had been moved beyond the Urals Mountains during the war, but the research facilities and rooms and Freitag working with both Germans and Russian engineers, was given the task of developing a design of an engine, the Badde-designed for a jet engine, turboprop, designated the Type 113 by the Soviets.

Design work of the engine, powered by an Interkontinentengen, Ju-52, a glider of 7,015 lb thrust each which had been rechristened the BD 10 by the Soviets, was completed on a heavily basis, and the Freitag team worked a design revision of the 131 designated Type 114. Projected parameters for the 131, however were not noted.

Badde, Freitag and other German technicians started onto the Soviet soil after being caught by the Russians above the German border from the first in the summer of 1945 at the same time a number of these colleagues were falling into the hands of the West in the case of Freitag, he was initially

imprisoned in Rostov until 1955.

In all, Freitag and his family re-

mained in Russia until 1955,

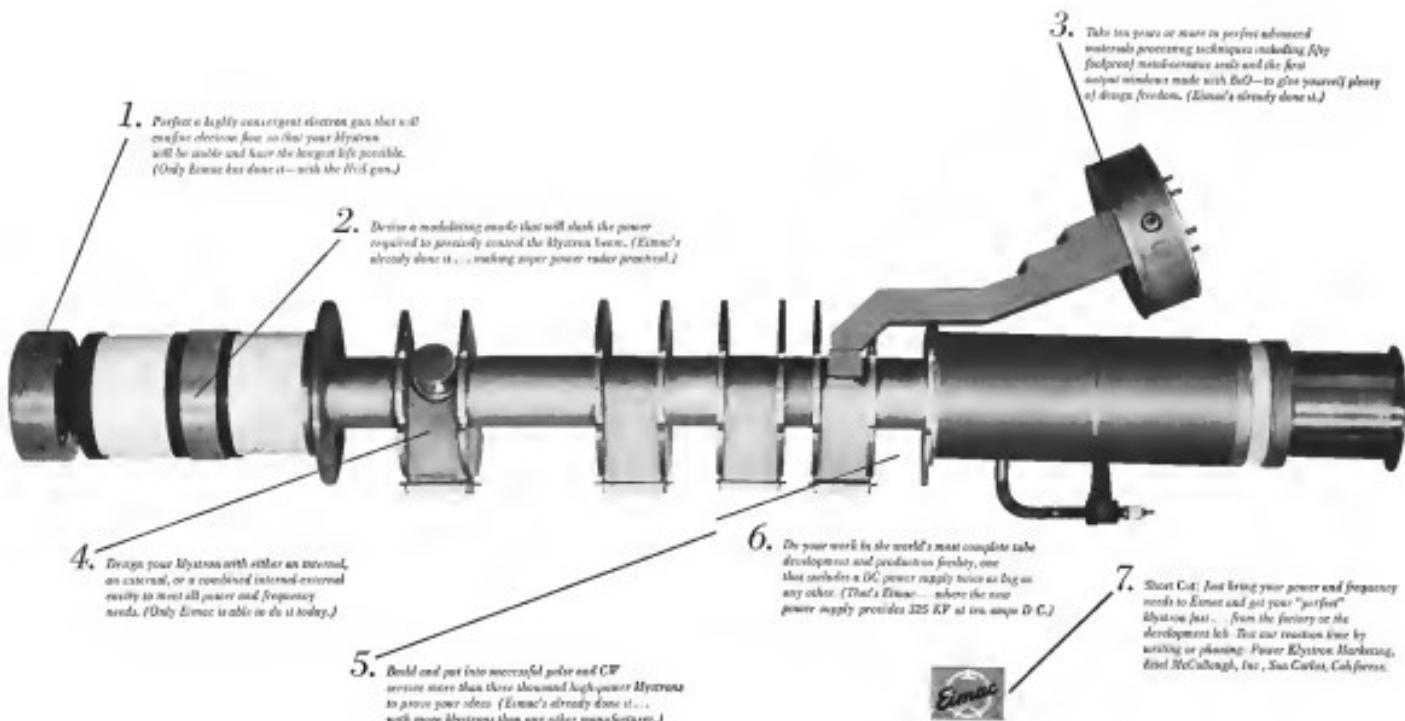
with his group working on a number of other designs, including a four-seat biplane begun in 1948, the Type 150, which remained on the experimental stage.

Freitag began work on the Type 132



HALL 22, 375 ft in length, was one of two new assembly buildings erected at Dornier in support of the 132 and other transport designs.

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while still in Potsdam and brought the professor's plan with him upon his return to East Germany with instructions to keep above the Indians than in a safe house. He was told at first that the new government's annual plan for software design and development would have to be located at Potsdam if at all possible. But he rejected the plan, as the basic idea was that the clear proximity of the area would provide added incentive to key prototype flight test operations.

He suggested Dresden as an alternative where the old Junkers factory was still available but was told that this would be impossible, with the government of two states for its autonomy, the site could be chosen from among all the three. Wittenstein and Rosenthal also favored and, two years later, the residents of Dresden had played a major role in the June, 1955 anti-Communist uprising. Adhesive to the letter was taken by Fertig to earn that, if Dresden, Dresden was not to be the location, the government would have to place it elsewhere.

The government then said that first that, if Potsdam was not acceptable, the pilot had to be located in the Dresden area, and Fertig visited a Soviet military base there that was in the process of being evacuated. He said the site was acceptable but first of all, "I must have a concrete landing strip." The East Germans agreed.

Production Under Way

This was in May, 1955. There was no runway and no facilities, but by early 1957 the first model for the initial Type 152 prototype was being built, and B-14 production was started.

During this time and through the following changes for the Type 152, the East German government financed or funds almost without question, but Fertig and his design team were expected to produce. Referring to the extent of how he had to spend at the plant improving the design of every thing from tooling to aircraft, Fertig says now his children saw how so diligent, "when I came home, they called me 'Uncle.'"

Although Soviet aid in helping the industry is at first not been much publicized, and the Russians haven't been averse to accepting the credit, about all the equipment at Dresden von Gersdorff and Gosselius designed, according to Fertig, and after the war was purchased directly from the West. "After 1945," Fertig says, "was an English Luftwaffe engineer."

Dresden staff was designed and built at an early within itself with its own research and development laboratories for simulated equipment, electronics, hydraulics and static testing. Gosselius-designed and built equipment included a high-speed Mich 144 section-type



Sikorsky S-64 Skycrane Proposal

Proposed Sikorsky S-64 Skycrane, shown above in sketch conception, will use detachable pods and rotatable tail boom for mobile refueling and cargo transport, maneuverability, field landing with communications coverage AFM, maneuverability and fire safety and towing. Helicopters will be powered by two Pratt & Whitney JT6D12A 2 gas turbine engines producing total of 6,400 shafted shafts at sea level.

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Coupling lead-popper bars at 47 feet x 10 feet—the largest in the world.



Mach 3 Technology

Torturing aircraft structures with the world's largest "gramaphone"

To pretest aircraft in flight speeds as fast as aircraft as advanced as the Air Force's Mach 3 B-70 Valkyrie, it was necessary to make sweeping advances in the state-of-the-art of testing procedures.

One way the Los Angeles Division of North American Aviation met this challenge was to build the largest, least-acoustical test chamber in the world. Here, a man-made 47 feet by 10-foot concrete lead-popper bar can blast aircraft structural specimens with up to 170 decibels of noise. This is the equivalent of 34,000 firecrackers going full blast; yet you can't hear anything because the noise is so intense that a discrete whisper outside the lab. The noise inside the lab is so great that the best generated could ignite fiber glass insulation material.

Borders of the B-70 Valkyrie

THE LOS ANGELES DIVISION OF NORTH AMERICAN AVIATION

Specimens up to 6 feet by 25 feet can be tested in the acoustical lab. It has the capacity for progressive tests as well as reverberant sound fields, grazing or normal incidence specimen environments, discrete frequency or random noise at sound levels up to 170 dB, thermal environment testing from -100°F to +1200°F; frequencies of 150 to 10,000 cycles per second. Test's isolated a remarkable facility for scratch testing, fatigue testing and vibration testing.

This giant acoustical laboratory can not only carry out testing on tomorrow's Mach 3 aircraft, but can perform tests on aerospace craft and auto parts from today. The lab is only one of the many that the Los Angeles Division has developed to conquer problems of space age flight.

DEFENSE CONTRACTS: Procurement Division. Director of Defense Contracts in personnel service division, AFM 100-100, AFM 100-101, AFM 100-102, AFM 100-103, AFM 100-104, AFM 100-105, AFM 100-106, AFM 100-107, AFM 100-108, AFM 100-109, AFM 100-110, AFM 100-111, AFM 100-112, AFM 100-113, AFM 100-114, AFM 100-115, AFM 100-116, AFM 100-117, AFM 100-118, AFM 100-119, AFM 100-120, AFM 100-121, AFM 100-122, AFM 100-123, AFM 100-124, AFM 100-125, AFM 100-126, AFM 100-127, AFM 100-128, AFM 100-129, AFM 100-130, AFM 100-131, AFM 100-132, AFM 100-133, AFM 100-134, AFM 100-135, AFM 100-136, AFM 100-137, AFM 100-138, AFM 100-139, AFM 100-140, AFM 100-141, AFM 100-142, AFM 100-143, AFM 100-144, AFM 100-145, AFM 100-146, AFM 100-147, AFM 100-148, AFM 100-149, AFM 100-150, AFM 100-151, AFM 100-152, AFM 100-153, AFM 100-154, AFM 100-155, AFM 100-156, AFM 100-157, AFM 100-158, AFM 100-159, AFM 100-160, AFM 100-161, AFM 100-162, AFM 100-163, AFM 100-164, AFM 100-165, AFM 100-166, AFM 100-167, AFM 100-168, AFM 100-169, AFM 100-170, AFM 100-171, AFM 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The S-C 2000 will display both video and alphanumeric data on all kinds simultaneously with any type of overlay. Display information need be transmitted only once from the data source owner to the inherent storage capability of the S-C 2000. The unit also provides both full-scale retention of data and various types of permanent hard copy. Completely dry processing is incorporated with data rates of 40,000 square characters per second. Scale changing, image magnification and display selection are accomplished at the control console, without interrupting the data flow.

A capability exists for seven color displays or data may be viewed as white against black or black against white. Resolution is 2000 lines per inch. The S-C 2000 was developed under the auspices of the U.S. Air Force and Mass Corp. If your requirements include computer display systems, we invite you to write for more information on the S-C 2000, a product of the company that produced the display control center for Project Mercury, General Dynamics/Electronix, Information Technologies Division, Dept. D-48, Box 3000, San Diego 12, California, or contact the representative in your area.

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Douglas A-4D lands in wet field with drag chute beginning to deploy and speed broken extruded U.S. Army completed a 91 week evaluation of three aircraft which are candidates to serve as an interim tactical fighter until a proposed VIGILANT tactical fighter with more advanced flight range is developed. Configuration of the team and the experience of the Indians that G-91 (middle plane) is U.S. Army markings, raises the question of whether the interim fighter will be operated by USAF. Perhaps Air Commando is the answer.

Tactical Aircraft Evaluated for Interim Fighter Role



One of the two Italian Fiat G-91 strike fighters at the trial that may a crowd of dust with power for takeoff from Nellis' auxiliary field at Tonopah, Nev. Northrop N-106 (below) with drag chute deployed lands at wet field during trials.



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<small>DEFENSE DATA DIVISION</small>	<small>DEFENSE DATA DIVISION</small>	<small>DEFENSE DATA DIVISION</small>	<small>DEFENSE DATA DIVISION</small>
Rep. Corps of Amer. Missile Defense Cambridge, Mass.	TO: [REDACTED] DIA Washington and Defense Direction	TO: [REDACTED] DIA Washington and Defense Direction	TO: [REDACTED] Production
Lockheed Missiles & Sensors Co., Sunnyvale, Calif. [REDACTED]	FROM: [REDACTED]	FROM: [REDACTED]	FROM: [REDACTED]
Chairman Def. Com. on Dis. Pow.	FROST & SULLIVAN, INC. 170 BROADWAY NEW YORK 38, N.Y. MAY 9-1080		

This is a letter contract event announced 7/3/81 expediting FCA's participation in the MIDAS satellite program. Purchasing agent is Herbert Priddle. The Lockheed Missle contract was awarded by the Air Force Ballistic Missile Division of Vandenberg AFB.

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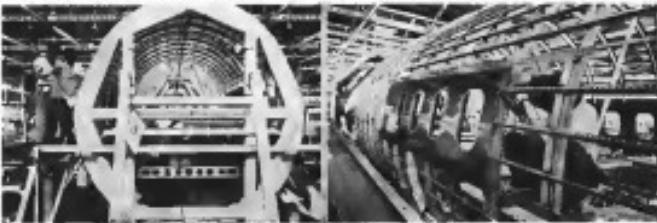


Final assembly begins in late stage in the Matsushita Heavy Industries Nagoya factory, as production of prototypes Nihon YS-11 turboprop aircraft begins. Four prototypes are scheduled for completion by summer, 1982.

Assembly Begins on Nihon YS-11 Turboprop Transport

Final assembly of Japanese-designed YS-11 turboprop transport is under way at Nagoya plant of Matsushita Heavy Industries, Matsushita Aerospace Manufacturing Co., Ltd., plan to have four prototype models completed by the summer of 1982 for test program. Nihon is a joint venture of the Japanese government and two Japanese manufacturing companies. The aircraft, developed as a replacement for DC-9 transports, will carry up to 60 passengers (SW Dec. 26, 1980 p. 62), a total of 15 now are on order from All Nippon Airways, the Japanese Self-Defense Agency and the Japanese Maritime Safety Board. Responses have been received from 15 foreign nations. Nihon reported. Cost of each aircraft will be approximately \$14 million, including taxes and commissions. The company tentatively plans to produce five aircraft in 1983, 10 in 1984, 15 in 1985 and 24 yearly thereafter. Prototypes will be built under Dassault 8 Di 101.

Wing (left, right) will have total area of 1,020 sq ft and an aspect ratio of 10.8. Aircraft is designed to carry up to 60 passengers, cruise at 257 ft at 20,000 ft, and have a maximum range of 1,250 miles, max with 5,400 lb payload.



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The men of SAC literally laid a road over all our heads . . . their presence providing continuous protection. This dedication to appearance is an example, yet it is the mission of the men and planes of the Strategic Air Command . . . As individuals or as an industry, we all contribute to maintaining and improving this vast defense force. AG Saenger's War Service is presently contributing by developing and producing a new all-weather Bombing Navigation System for SAC's B-52s. This system, when installed, will provide the B-52s with greater high speed bombing accuracy at low levels, eliminating hazardous ground obstacles. This new product by AG Saenger Plus Services underscores the need for precision.

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16



If you are an experienced radio engineer interested in working as advanced airborne navigation systems, please contact Mr. G. F. Rosecr, Director of Scientific and Professional Employment, 7025 North Central, Milwaukee 7, Wis. All qualified applicants will receive consideration. No employment agency will be paid to place this classified advertisement.

Chicago Extrusion Alloys—A. G. Glass, president extrusion and aluminum division, has been elected chairman of committee to help in the planning of the 1965 meeting of the Illinois Extrusion Association. The new committee will be responsible for the organization and general coordination. G. H. Muller, executive vice-president, has been appointed to serve as chairman of the program committee. Other officers elected were: W. E. Johnson, chairman of the technical committee; R. L. Smith, chairman of the membership committee; R. L. Johnson, chairman of the public relations committee; and J. C. Johnson, chairman of the financial committee.

Many others are not on their lists. The total amount of expenses 1910-1911 was \$1,000,000. This sum included contributions by students, parents, friends, and business men. A. C. Shedd, Jr., director in salary, was the highest paid member of the board of trustees. The total amount of money received from the various sources was \$1,000,000.

and maintained by the resulting joint
venture, to which \$100 thousand, a \$1
million Mexican loan, the names of
cooperatives, a 40-kilometer diameter
and autonomy are added. It will become
a state Park. In 1999, 1000 hectares,
with 8000 inhabitants, E. "El" Rosario.

W. H. Morris, 1000 N. 10th Street, Oklahoma City, Oklahoma, has filed a claim for services rendered by him to the State of Oklahoma, William A. Henshaw, last \$1,000.

W. H. Bremner and William Lewis,
1911-1912, 1,000 shares of common stock
at \$100 per share; T. W. Goss,
1911-1912, 100 shares of common stock
at \$100 per share; C. E. Johnson,
1911-1912, 100 shares of common stock
at \$100 per share; E. A. Johnson,
1911-1912, 100 shares of common stock
at \$100 per share; E. L. Davis,
1911-1912, 100 shares of common stock
at \$100 per share; and Eugene
H. Morris, 1911-1912, 100 shares
of common stock at \$100 per share.
The stock was issued to the officers
and directors of the company.
W. H. Goss, 1911-1912, 100 shares
of common stock at \$100 per share;
T. W. Goss, 1911-1912, 100 shares
of common stock at \$100 per share;
C. E. Johnson, 1911-1912, 100 shares
of common stock at \$100 per share;
E. A. Johnson, 1911-1912, 100 shares
of common stock at \$100 per share;
E. L. Davis, 1911-1912, 100 shares
of common stock at \$100 per share;
and Eugene H. Morris, 1911-1912,
100 shares of common stock at
\$100 per share.

Volume Seven and the previous
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The characteristics of greater length and a stronger material make Hitzo-C Extrem superior for casting operations. Molded and laminated parts fabricated with Hitzo-C demonstrate excellent physical properties.

For full information about the Treatment Bulletin 1-10

1

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WEST-ON-DELL, NEW BRUNSWICK: PINEWOOD FIELD PRODUCTS LTD., Tom Kermode, 28 Coopers Road, Deltafire, Ont., E8J 2H4. Tel. 613-496-1200. Fax 613-496-1201. Web site: www.pinewood.com. E-mail: kermode@pinewood.com.

New Offerings

The **TurbineGen Corp.**, Washington, D.C., improved under Maryland law in December, 1960, for the general purpose of recovering, developing, manufacturing and marketing air breathing engines, nuclear propulsion engines or gases which would not burn at a source of power power for electric power generation, aircraft, space vehicles, flying objects or other purposes by means of production in outer space and areas of product and technological development whereby there. To date the company's activities have been entirely organizational in nature. Business consists of perfecting a new type of air turbine engine with a combined heat exchanger and to be assigned which is the invention of Dennis Phenomen, a vice-president of the company. A patent application has been filed on which further extension research and development as required. Offering is 200,000 shares of common stock, for public sale at \$2 per share. In the event the Project number mentioned is developed partly by the company and/or existing gas-turbine manufacturer toward which negotiations are now in progress) the proceeds will be used for operating capital and research facilities and utilization of the investment is developed, the company will receive a percentage of the proceeds will be used principally for research and development activities as well as working capital.

Assignment: manufacture star-shaped flame shields, heat shields, and other impound structures for NASA's Saturn booster. That's only one side of the Lockheed/Bearcat aerospace story. We offer space-oriented research (cryogenic lab, hypersonic shock tunnel, human factors). We know how to build huge structures. And we're at the hub of the Strategic Southeast—practically next door to Huntsville and Cape Canaveral: **LOCKHEED/GEORGIA**



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"FORGING MILITARY SPACEPOWER"

USAF SYSTEMS COMMAND ISSUE

SEPTEMBER 25, 1961



On September 25, AVIATION WEEK and Space Technology will publish one of the most important issues in its history . . . "FORGING MILITARY SPACEPOWER" — USAF SYSTEMS COMMAND ISSUE. For the first time, the complete story of the newly activated USAF Systems Command will be presented to the aerospace industry throughout the world.

The new Systems Command will serve as a single agency to control R&D and procurement of all aircraft, missile, avionic and space systems for the USAF from the idea stage through the time they are in the field ready for use. This concept of a single agency for both systems R&D and systems procurement will have penetrating impact on all aerospace industry companies selling hardware or

research services to the Air Force.

The Systems Command will control approximately \$15 billion in contracts and annually will award \$7.8 billion in new contracts making it the most important single source of aerospace industry business. Further evidence of the impact on industry are policy and procedure changes which can be expected in many areas such as technical approach, contract competition, proposals, cost estimating, management structure and subcontracting.

These are just a few of the important details to be covered in the Systems Command Issue, which will constitute a new handbook in doing business with the Air Force. Teams of AVIATION WEEK editors are now visiting the various bases of the Command for full, complete reports. Detailed edi-

torial coverage will be given to procurement, organizations, plans and programs, policies, procedures and future technical activities.

AVIATION WEEK is privileged to present this edition to the industry covering our newest and vitally important Command. Prime contractors, subcontractors, suppliers and firms doing R&D work for the Air Force will be extremely interested in this new issue which will lay the groundwork for future contacts with the Command. It will supersede all previous editions on USAF research, development and procurement policies.

Your company is urged to participate by advertising its capabilities and facilities for the furtherance of the defense effort. Write, wire or call collect for space reservations.

Aviation Week
...Space Technology

A McGRAW-HILL PUBLICATION
330 West 42nd Street, New York 36, N.Y.

U.S. Sailplane Market Potential Increasing

By Erwin J. Bellman

Wichita, Kan.—Growth of the U.S. sailplane movement in a potential market was apparent during the 25th annual meeting of sailplane manufacturers here Aug. 1-16.

Major increases in the number of soaring enthusiasts, plus a noticeable sophistication in design of new sailplanes toward higher performance and growing acceptance of sailplane rental vehicles, point out that this is becoming a field of interesting potential for import and flying service operators as well as new electronics and other aircraft equipment suppliers.

Registration Increase

As a measure of the increased growth of the soaring movement, there has been an increase of 17% in the annual sailplane registrations in the last three years. A Federal Aviation Agency observer noted here in American Samoa and a member of the Kansas Soaring Association, which conducted the meeting, added that in that state he knew of no sailplanes five years ago—he estimated that today, there were approximately 18 and the state organization has some 50 members.

Just as impressive was the expression of what this increase in interest is meaning in hard dollar volume terms to the soaring sailplane manufacturer in the United States. Schweizer Aircraft

Corp., Elkhart, N. Y., which was founded in 1935 to build these improved aircraft, said:

Schweizer has developed to the point where this year the company had already built as many aircraft as it did all of last year. Paul Schustermeier, president, and he expects that volume will continue so that the company should just about double the business it did last year, when it turned out between 30 and 35 sailplanes. Indications are that dollar volume, including the company's school, sales of aircraft and other allied sailplane operations will total some \$250,000 this year.

Production, which is now running at about one complete sailplane every two days, including some aircraft orders, is divided at approximately 90 percent on the single-seat 2-32 and single-place 1-26 (designed about evenly between these two models) with the remaining 10% being taken up by the single-place 1-23.

Initial Details

Initial details of a new high performance sailplane planned by the company for delivery next year have been disclosed briefly by Schustermeier. The new model 2-32 is based at broadening the varieties of enthusiasts by making it possible for sailplane pilots to introduce the sport to friends and members of their families at a higher performance level than the company's present types. It

has the capability of being used as an advanced trainer for young and more experienced, and also may be used for competitive, record and record flights in the single and two-place categories.

The increased emphasis is evident in the design for high-performance, in one of the important areas considered in the basic design, Schustermeier explained.

The fuselage will be all-metal monocoque construction, with wings of metal construction with aluminum and possibly some parts of the wings fabric covered. Landing will be tandem, with the rear passenger seated higher. There will be more room for the pilot's feet than in the earlier model 2-35. The engine will be one-piece and the tail will be empennaged.

The 2-32 now is under construction.

The company plans to hold all deliveries on backlog up for production until this fall.

Among the interesting new design features during the meet here, indicative of attempts at sophistication which marked increased classes of new sailplanes, was National Champion Richard Schauder's HP 10 featuring a novel wing leading edge covering for the most part of metal honeycomb construction and having a Kevlar plastic material leading edge. The Toledo, Ohio, pilot has plans to exhibit the HP 10 in lot form at a price of approximately \$3,500.

Design Highlight

The other new sailplane was Louisville, Ky.'s Senn's 518 800-meter type in complete form of all-aluminum construction. A highlight of this design was the interesting approach in trailing edge flap/Skin stiffener trailing edge, the author wanting to reduce minimum elevations of the wing surface by eliminating gaps caused by conventional separate stiffeners. This approach also requires simplifying construction by eliminating the need for leading edge rate flap components and lengthening them to the wing. This high performance sailplane which has a 53-meter wingspan, a 100-hp engine and a load limit of 410 lb., has achieved an average speed of 100 mph for two hours over an endurance flight in American Samoa.

Indicators are that Senn soon has about five sales. Aircraft will be built in Arlington, Tex.

Foreign designs comprised a good percentage of the 36 sailplanes attending the competition here—approximately



Hiller E4 Used to Fight Forest Fire

Hiller E4 biplanes service for fighters to blaze in Sequoia National Forest. Retiring west passes three for fighters, fire equipment and paper dropping bags. The aircraft also could be fitted with a detachable water bag to make water drops for firefighters. Biplane submissions during the fire, was 5 hr. per day, maximum allowed by the U.S. Forest Service.



Cessna 172 in action. Charles H. during practice session prior to National Soaring Area meet at Wichita, Kan. recently. Flight was made from Wichita Field on Aug. 10. Bill Thompson, Cessna chief of experimental flight test, is piloting tow plane and Paul Wilson is towing glider in a 2000 ft. altitude in about four minutes time.

nearly half of those present were imports, primarily German origin. The imports were represented by a large group who noted that they used the EMB canopies approximately 53,200 hours at New York. With the Daytime free flying an overall average score here in five times less than that of a comparable U.S. manufacturer—wings rates are approximately 500 rpm per hour—it can make suddenly an exceptionally diverse product here even with others and shipping costs.

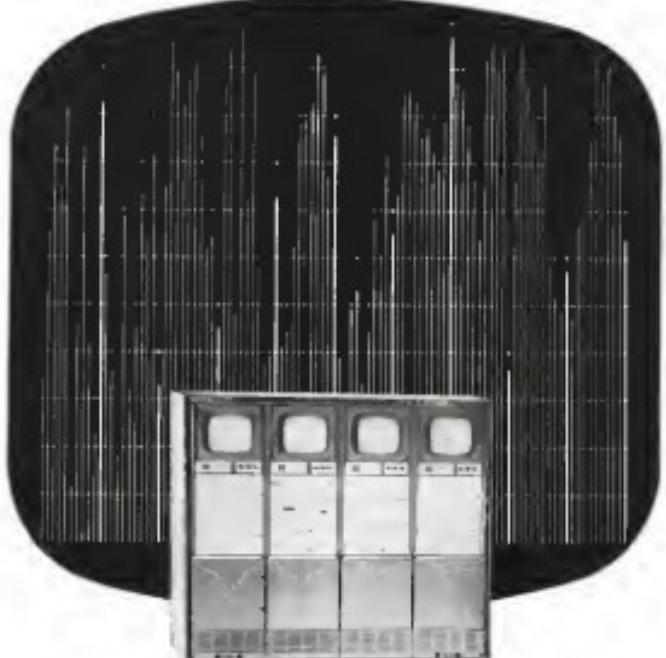
Indicators are favorable that there is little better facing regarding this plane class—still at present, the thinking is that the market potential is so large that there should be no reluctance to do more here. Some discrete problems are the low load high glide ratio which is 9 to 15, well in the low end of distance hauler when the user needs a higher performance type and enough room for multi construction.

Indicators are that the rapid growth

of sailplane interest has caught the attention of the Federal Aviation Agency which has been concerned in attempting to regulate the movement. At least one FAA task force has been assigned to study the EMB canopies approximately 53,200 hours at New York. With the Daytime free flying an overall average score here in five times less than that of a comparable U.S. manufacturer—wings rates are approximately 500 rpm per hour—it can make suddenly an exceptionally diverse product here even with others and shipping costs.

Indicators are favorable that there could not really be a similar situation in the glit, whereby whether the passengers could make a significant contribution in saving weight by removing that should furnish a privilege to extended to other areas if travel must be the only mode of passing time, construction, however, is likely to remain slow, especially in areas remote from large population centers. Additional public interest could be created and operators should find it easier to withstand the competition and larger audiences could be expected.

Judging from the comments of some participants, Cessna Aircraft, which supplied lots model 187A and a 172 and 175 in tow planes, has gone provided a demonstration of their an-



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The Raster Display System gives McDonnell's launch crew instant visual display of vital data during missile checkout. Its bar graph presentation of such variables as temperature, pressure and acceleration provides a quick indication of total system performance.

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ability for design and packaging of advanced electronic systems. It also makes a significant contribution to display systems for military and industrial applications. To learn how Radiation can help solve your advanced electronic problems, write for our "Capabilities Report." Radiation Incorporated, Dept. AW-5, Melbourne, Fla.

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Make a note in your Rutherford display at WESCON

Sailplane Winners

Worrell, Ken (Fighting), a Gorham EG-710 ultralite A-1 Smith, Tonawanda, N.Y., was the 25th annual National Soaring Champion. Steve Smith moved up from third place to first on the final day of the meet by taking the final run-on 100m speed run from Wichita Municipal Airport to Salina, Kan., municipal airport—with an average speed of 41.7 mph. His final score tallied 4304 points.

Second place went to William S. Evans, Jr., San Diego, Calif., flying a British Swift, who averaged 40 mph in the final day's competition to score 4194 points. Second best scored in the event was 41 mph, made by Kit Dorn, Hazelwood, Ill., flying a German KA-0E. His final total score was 6218.

Third place or young went to Rudy Vlotten, Redfield, Wash., flying a German KA-0CR with 4234 points.

place's capabilities in this area that could motivate use of these types for this work.

At one recent official powwow on labor expenses among the German auto firms very promising and the airplanes appeared to have low obsolescence relative to some higher powered types such as Douglas BT-13s. The expense here goes for wages, benefits, pay rates, tool charges, overhead charges, exceeding the airplane's limitations, yet rate of climb is so good that rapid take-off is possible. Could we, for example, of two aircrafts each, each weighing about 3500 lbs. at 100% of gross weight, experience a take-off in 1000 ft. at 50 mph? Could we fly 2000 ft. in 1/16 of a calendar hour and the aircraft in aerial operation has been producing 17 tons per helicopter? At a rate of \$5 per hour, many operations could make this a profitable venture in addition, one obvious

One Korean fixed base operators has built a steady workload and holiday business utilizing a German 101 as a passenger tow, making approximately 3500 a/c ft. of flight time. Experience indicates 100 passengers per flight, 8 ft. a tree in 2000 ft. in 1/16 of a calendar hour and the aircraft in aerial operation has been producing 17 tons per helicopter. At a rate of \$5 per hour, many operations could make this a profitable venture in addition, one obvious

PRIVATE LINES

Korean Photo Area has formed its own credit union which will have its headquarters in Seoul. Wichita now has a potential membership amounting to 500 people.

Many of Transport of Nigeria has purchased a Canadian Chinook which will be used to transport govern-

ment officials in the African nation. Nigerian crew in being U.S.-trained

Baldwin Brutly, B-2, ex-pilot, has been elected president of Auto Expressmen, Inc., Des Moines, Iowa, recently. Brutly married a producing 15 hub capsules per minute at the company's Urbandale, Iowa, plant.

Federal Aviation Agency Administrators

on N. E. Huldy, Sen. A. S. Monroe (D., Okla.) and Project Hurricane Chaser Fred M. Clark will be featured speakers at National Business Aircraft Assn.'s 14th Annual Meeting and Forum of Farms, Okla., Sept. 17-18. More than 100 manufacturers and service firms have indicated that they will display their latest business aircraft in NBA's static and flight demonstration at Tulsa Municipal Airport.



Bristol Bulldog Restored

Bristol Bulldog fighter pre-World War II Royal Air Force fighter will be presented to the Farnborough Collection of Great Britain. Aircraft was rebuilt by Bristol Aircraft and the Jupiter radial engine being installed in British photographic war plane by Bristol-Siddeley Engines, Ltd. Painting the fighter is Godfrey Arts, Bristol chief test pilot. The aircraft uses Bristol root registration markings.



New 10-place jet trainer

The Lockheed C-140 is a compact jet transport. It flies fast and high like jet fighters and interceptors—at just a fraction of their operating and maintenance cost. It can train an entire class of students for hours at a time, rather than one man for a few minutes. And students learn the fine art of operating radar and weapon control systems in tactical and strategic aircraft in a favorable environment, because the C-140's center cabin is pressurized and air-conditioned. Students see the real thing on their radarscopes and instruments. The Lockheed C-140 also cuts stretch defense dollars when used for navigational aids checking, casualty evacuations, aerospace system flight testing, and for high priority cargo and passengers.

LOCKHEED GEORGIA



Lockheed Aircraft Corporation, Georgia Division, Marietta, Georgia.

PRODUCTION BRIEFING

Teletronix Corp.'s Advanced Structures Division, Mountain View, Calif., will produce housing, funding structures, and pressure housing cover (thin 5006, 160) for Avant's PDU 75 Infrared telescope for under contract from Bell Helicopter.

Bellcomm, under a number of Federal Civil Block I jet trainers has placed an initial Air Force Contract order to start service with Da Nang Training Command, is powered by the British Siddeley Dartmark 101 generating 4,710 lb thrust. Argosy replaces the Vought T-33.

Moogcraft Corp. will supply switches (SUDU) housed within a structural load frame at National Aero Space and Test Laboratories, Langley Research Center under a \$95,000 contract. Switches will have 100% testing temperature from 100°F to a maximum of 2,000°F.

Requirements study for a nuclear thermal detector or particle counter for automation in spacecraft and next in the assembly of a module to return samples will be made by Chance Vought Corp.'s Astronautics Division under a \$75,000 contract from USAMRMC Aviation Systems Division. One requirement is that the system signal the avionics or ground controller of reentry damage and automatically activate corrective measures to evaluate the case prior to landing through the return flight.

Northrop Corp.'s North Division, Hawthorne, Calif., has received a \$75,000 Air Force contract to study acoustics for spacecapsule. Receipt of the one-year contract came after a two-year computer-aided research program on acoustics.

Ryan Aeromarine Co.'s Aerospace Division, San Diego, Calif., has been awarded a \$155,000 contract to design specialized personnel and aircraft for continuation of Asia's Far East round-the-world ballooning at White Sands Missile Range, N.M. The contract also calls for three Model 124-E balloons, a special Asia configuration of the basic Q-36.

Modifications of the T-33A Major mode will be performed by the Good Year Aircraft Corp. under a \$5115,530 contract awarded by the Air Force. Included in the improvements being installed is a rapid fire carburetor burner system.

Angus Corp. has received a \$1,454,769 contract from Navy Bureau of Ships for production of TH4 two-channel, three-head magnetic tape recorder/reproducer.



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SIZE 11 DC TACHOMETERS

These Kearfott DC tachometers are especially durable and specifically designed to provide reliable service over a long life. R5608-001 is an uncompensated unit ideally suited to function as a stabilizing element in a standard DC servomechanism. The R5608-002 model offers the precision required in computing applications and is temperature compensated to maximize its high accuracy over the temperature range of -15°C to +71°C, with variations of no more than .1% of values specified at 25°C.

	R5608-001	R5608-002
Gated belly/ 120 rpm	2	2
Rated Speed Open	5-50 rev/min	
Lengtgh	3600	5000
Vibration Rating	97	.1
Output Impedance	125	
Stall	—	36
Rated Voltage	2% above 200 rpm	2.5% of 3600 rpm
TYPICAL ELECTRICAL DATA		
Fricton Torque 34-40	0.25	0.25
Motor Moment of Inertia (in-lb sec ²)	7	8
Weight (oz.)	55	55
Wait for complete info		
KEARFOTT DIVISION GENERAL PRECISION, INC.		
Little Falls, New Jersey		

NEW AEROSPACE PRODUCTS



Pressure Pilot-Controller Starts A-10

Pressure pilot-controller permits shutdown of plant compressor set for starting jet engines. The device is shown during a Navy A-10 attack aircraft at North American Aviation. The pressure pilot-controller prevents the use of plant compressor set by regulating air pressure so as not to exceed 64 psig. This is the maximum pressure allowable in storage for A-10's General Electric T70 turbofan engines. The price of the regulator unit is \$4,900. It is made by U. S. Gauge Division, American Machine and Metals, Inc., Schenectady, N.Y.

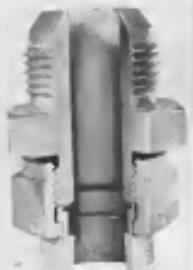


Integrated Flight Indicator

Low cost integrated flight instrument provides for private and business aircraft controllers. VOR/LOC course deviation indicators and glide slope indicators with the gyro compass.

Based on conventional Sparco air-driven gyro. The indicators are available in two models: Model 1, priced at \$1,018; and the VOR/LOC course deviation indicator, Model 2, costing \$1,293. The 2-gyro design has a lag alarm and visual and lighted digital readout. Metric units of measure are available. ARINC standards (1,000 ohm meter movements) and the inputs to the pilot instruments were supplied by a NASA engineer.

Foxair City Aviation Service, Inc., 709 Congress St., Portland, Me.



Steel Luggage Conveyor

Bags are conveyed belt at Massena's DeGraw Airport a distance of 24 m with stops along the way.

The 192 mm thick steel belt is expected to reduce maintenance, helping and to smooth surface permits easy removal of luggage. The conveyor belt is held to the underside of the 75 ft long belt conveyor in several places to provide continuous traction.

Sands & Steel, Inc., 1792 Nevers Rd., Far Linen, N.J.

goal of previous bending the sheath and pulling. A flat seal over a liquid nitrogen tank virtually eliminates the need for liquid wrench methods. By graded for rapid tubing or large pressure. These have application. On fittings are produced in -2 in. -20 mm with larger diameters available on spec of order. Branteflex Corp., Rutherford, N.J.

Helicopter Sling

Nylon web helicopter lift sling, in production for the Marine Corps, has a working capacity of 10,000 lb.

Each of the four lifting webbing legs will support 5,000 lb, and the entire lift ring will support 40,000 lb. A modular 20,000 lb center buckle permits adjustment of each leg individually. The lift ring is bolted together.



presenting it as a leg strap to be changed in the field without sewing. The sling assembly made up of six webbing 12 in. wide, weighs less than 30 lb.

General Logistics Division, Aerospace Corp., 2529 Floyd St., Burbank,



KEARFOTT

developed

and now produces the
all attitude heading and vertical
reference system

for the Lockheed **F104J**



Engineer

Kearfott offers challenging opportunities
in advanced component and system development.



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Little Falls, New Jersey



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SAFETY

CAB Accident Investigation Report—Part II:

Tranquilizer Usage Linked to DC-3 Crash

(This is the concluding part of the CAR accident investigation report on the crash of a Pan American Airways Douglas DC-3 near Charlottesville, Va., on Oct. 30, 1959. The first part of the report, which appeared in the Aug. 14 issue of *Aerospace WING*, covered the history of the aircraft and the flight, the origins of the severity of vibration, and a report on the accident's post-accident investigation.)

One witness also described the fire and that after the fire the dismantling engine would stop working but that she heard no sound like a crash.

ballies, others in the mountains, heard the aircraft pass over toward the mountain and at 2045 heard a sound like an explosion. Still another stated she had not heard the aircraft but did hear a sound like thunder. Short duration 80s, glorified by noise after 2045 and before 2046.

HAL 11313

Examination of the nestling. At 9:15 we removed no evidence of medication or oil from the nostrils or respiratory tract. There was no evidence of any a flight for all major components of the nostril were intact as the mandible, each side, and a septum clearly evident that both nostrils and premaxilla were capable of normal operation prior to surgery. There was nothing found indicating that an emergency control before the accident. These findings, studied by examination of the available physical evidence, are substantiated by the statement of Mr. Slesinger.

In stages increasingly separated in time, all of the species that the woodpeck developed from the destruction by avian scavenging was made in Flight 3. The most recent evidence is to my knowledge that the woodpeck approached the nest hole in the tree trunk, and then, as it approached, the tree apparently appeared to the woodpeck as if it were approachable, possibly parallel to the preceding nest hole approach, but this is the Rockhopper situation in the Chatham Islands, but it is 15 km west of the nearest land. The relationship shows that the woodpeck relied on the nest hole in the tree trunk to approach 5 to 15 m of the designated tree for the subsequent approach procedure. It is clearly apparent that at the Coast and the Ridge visited a tree had to be initially heading in a north-easterly direction before it could be approached. By its location and its north-easterly orientation, the tree was associated with the ridge, and the position of the tree was apparently known to the woodpeck heading towards the ridge. 14.32 sec.

After the two or eight days, northward or, as far as can be determined, a distance of two to four miles and ended against the side of Buck's Ellipse Mountain. I studied an approximately the leading of the colored points of the quadrangle from both the leading way estimated. The elevation of the creek, however, was apparently 400 ft. below the altitude specified

All this evidence is in most agree-
ment. But the general behaviour
of the general maneuvering on
the part of the instrument approach
plane during 5 to 15 sec. west of the
final maneuvering area presented no
such

It is apparent that the flight record book will not be the subject of a major investigation effort set up on that basis. The record books themselves contain no information concerning flight logs. This effort emphasizes flight and ground crewman's flight and the German crews' flight. The Germans' records may be inspected separately by the Flight Inspection Board of the Air Force, and British using specific procedures already adopted for the purpose. It is believed normal operations of the

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that it was sold throughout the
country by several dealers.

and long segments specified for the house.

Location Equipment

entirely destroyed, the airborne equipment was determined by evidence to have been properly in an automatic approach, indicating equipment on which the Cessna approach was based. Because of a problem common to the aircraft, neither did the NDF mark the point accurately. After investigating at the scene were the positions of the aircraft relative to the crash landing. The estranged husband at the red NDF long pantsuit passed nearby the location of the committee

ances to which such was based. The angle formed between the bearing of the sun at the horizon equal to $90^\circ - \delta$ from the zenith. This angle does not change during the day, but varies with the date. The angle α (the angle of deflection) was decreasing with time at the moment of the accident. Further it changed little between successive observations. The angle β (the angle between the vertical and the horizontal projection of the sun's rays) was constant at 90° during the whole period. It is probable that the flight flew about 35 min after reporting Ročec, with it crashed. Thus the time being considerably longer than the time required to reach the front. Ročec, to reach the front, and the probability here shows a greater distance went back from Ročec. A plot of the probable flightpath at various time was therefore prepared using the same form as a map.



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groundspeed of the DC 5. This time of that 15 sec before the impact the aircraft would have been in a position about 13 m west of Bachelle's intention.

The second photo of the work was a series of action shot from the Camera unit. Based on the elapsed time between the Camera and Radar, around 11 sec, a 40 deg deflection of the signal source was found from Elton. A line of position with a radius of 11 m from Elton Camera was found to intersect the initial point at a location which was approximately 15 m east from the crash site again about 13 m west of Bachelle's intention.

At the completion of the work two of the deflected signal sources were apparent. The point of intersection of the plots was closely coincident with the 100 deg radial of Goudenrode. Secondly, the leading to the location of intersecting plots from Elton gave the 20 deg radial of Cambray and the time as the aircraft failed to Cambray from Springfield.

Captain's Duties

M Captain Captain Deller made the primary report and most probable record of the flight plan to Elton. Thereafter he used his equipment to record the Goudenrode frequency and select the 100 deg radial in order to identify the Bachelle intention. Considering the small amount of time available at the time, the first action could have devoted his attention to the general course which the captain had selected. The second action, however, turned his eyes to Goudenrode; though necessary, would also reduce his opportunity to observe by some indication the relative position of the aircraft to the course of the area. Additionally, there was evidence that Capt. Laversay flew with a lower than normal altitude during the approach to Elton. In the Board's opinion these factors are valid entries in this instance for the captain not having observed the navigational situation.

After reporting Bachelle and turning to the Elton heading it is likely that both the captain and co-pilot were developing a probably very brief sense of how much time remained until they reached their destination. The sound track from Elton to the Chelmsford tower. It is the Board's opinion that at this time the right turn, or that 35 m northwest of Bachelle, was made. This position may be to their order of 100 deg from Bachelle, or the Cambray sector. The position ahead the captain's course of the right turn to one mile east of the specified track. The last turn he positioned the right about 60 m from the ground level before reaching the Bachelle intention.

It is believed that his latter turns could work to observe the lateral course which existed during the northeast portion of the flightpath. The greater distance from the signal source would reduce the angular displacement of the ADF presentation. Thus, if the aircraft was positioned 10 m behind the intended track, the angle of deflection to be in air plane, the angular deflection of the ADF presentation caused by the lateral course error could be observed considerably for the greater distance. For example, the ADF presentation 14 m from the signal source and right to one mile west of track is seen distinctly different

than the presentation 12 m from the signal source and three miles west of the specified track. Similarly, the ADF presentation 19 m from the signal source and right to one miles west of track is not distinguishable different than the presentation one mile from the signal source. These sources of error are of little concern in the light of the present record. In addition, as the flight progressed toward Elton, the angular deflections of the signal sources became more distinct as the pilot's path from a point distance from the aircraft but from a greater distance than believed by the pilot, the increasing angle of displacement of the ADF needles show one final error could be interpreted as a closure on the signal source. The Board believes the foregoing discussions, in a simplified manner, indicate that the pilot's path was altered only in the approach to the legal lateral track error.

On the other hand, the Board is aware that at the flight presented on the south west course the rate of progression of the ADF needles from the 100 deg radial to the 20 deg radial was more closely spaced in the result of the greater distance and time to Elton. At the 90 deg position the angular spread between the needles would have been much narrower 9 to 10 m west of the location where Elton to five miles west of Elton. The Board is further aware that the approximate 20 deg radial bearing changes on a flightpath due to four miles west of the house, would 30 to 40 m as is illustrated to approximately 14 m on a flightpath about nine miles west of the house. In addition, the ADF presentation of the 100 deg radial, when it struck the concrete wall, must have been incomparable with a closure precision. The Board believes that these findings should have served to alert an attentive pilot that the lateral course does not yield considerable magnitude.

During the course of the investigation the Board interviewed Capt. Laversay and received his mission, qualifications and proficiency reports were unobtainable. His history showed that he had progressed from airman to captain and had served in that capacity since May, 1957. It also showed that he had been assigned to the Chelmsford tower and over the years had been promoted from a regular basis. Capt. Laversay had flown a total of 1,300 hr., of which 4,271 were in DC 1 aircraft.

To the Board there were numerous factors which were obviously associated with Capt. Laversay's error. Some of these factors were the inherent nature of the instrument concerned, a radio aid device to precise landing procedures, and a decision before the instrument procedure took altitude. Other were the failure to note that the time for return power was an interval of 10 sec. associated with closure precision, and that ADF presentations were not comparable with the normal procedure from presentation. Still others were a failure to respect the limit. One interesting feature which the instrumentation did not furnish is, and not using the air traffic service given as permission for the target signal.

It is believed that Capt. Laversay's position in an operating pilot led him under the influence of a moment of confusion to expect a greater degree of precision than was expected during an instrument operation. Because of these factors a complete human investigation was made into the personal background of Capt. Laversay. The

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were done its track for reasons which could seriously impair his overall planning ability. Does this mean that he should be found wholly innocent at his prosecution?

Capt. Levine had, for several years been under investigation now. The Board considers that disclosure of detailed action taken relating thereto would obviously affect the status of the investigation and the interest of the majority of the public. A review of the Board's significant findings and certain recommendations, however, are in the public interest and we act forthwith.

Capt. Levine received penicillinotherapy on 1951-1954, he suffered further penicillinotherapy in 1958-1959. His penicillinotherapy was resumed in May 1960. Capt. Levine had a dental treatment from a week thereafter. His last penicillinotherapy was the eighth month of treatment. This latter treatment involved the removal of two penicillins. In the name of this treatment the film penicillinotherapy involved certain penicillin drugs. At least one of these penicillins, Penicillin G and Thiomycin, are prescribed in August, 1959, in a dosage of three or four tablets each and one tablet on Sept. 15, 1959. This prescription required an interval which if taken as directed would have last until just 14 days into date before the next-dose.

Second Doctor

On Sept. 25, 1959, however, Capt. Levine commenced penicillinotherapy under the second penicillinologist who prescribed no drug. The doctor had no knowledge of the previous treatment. From this date Capt. Levine continued to take the medicine in the prescribed manner during the later treatments, although there is evidence that he took the earlier oral prescriptions.

The Board has evaluated the findings of and hearing of Dr. Levine, and finds that the set of facts above, in addition to refuting all the possible information concerning Capt. Levine to purport to qualified medical experts to evaluate as is in agreement with respect to this incident.

The consensus is that Capt. Levine was so heavily burdened with mental and emotional problems that he should have been relieved of the tasks of flight duty while undergoing treatment for his insomnia. This condition was such that penicillinotherapy with his problems could not have lowered his standard of performance during navigation flights. Furthermore, with respect to this hearing, the consensus is that the continuous and mental problems were far greater importance in insuring poor cockpit performance than would have the use of penicillinotherapy.

The Board believes that the facts described in this investigation demonstrate the adverse effects of penicillinotherapy and mental stress on aviator performance and persistence. It further believes that the early recognition and correction of such conditions which might tend to impair an aviator's proficiency and performance would be beneficial in flight safety. Accordingly, the Board recommends that the Federal Aviation Agency, appropriate segments of the weapon industry, and the medical profession initiate exploratory studies in this field.

The Board also considers that the conclusions of this accident demonstrate the

need for reexamination of the use of drugs which may affect the function of a fighter aircraft in its mission contrary to its safety.

Since World War II there have been great advances in pharmacology and many new varieties of drugs have become widely used. The problem is to determine which are most effective. Since 1950-1954 one of the most significant advances has been in the field of psychopharmacology. There has been a proliferation of drugs which influence the state of mind, as applied to the treatment of psychiatric emergencies. Within this group of drugs the so-called tranquilizers are being widely used by the public.

The basic question which the Board has found must be answered, therefore, is how does the use of these drugs relate to the rules of flight? For example, with the framework of the present Civil Air Regulations covering the use of drugs, should those drugs be classified as "A" drug which affects his (pilot's) abilities in any manner contrary to safety? The Board is of the opinion that the answer to the question is "Qualified - yes". In great part

because of the use of drugs, aircraft accidents could occur as a result of the error which arises in the behavior of individuals who are not fully aware of the potentialities of their actions in any manner contrary to safety. A pilot should not practice any practice as he wishes, but should practice only practices which are safe. The Board, therefore, recommends that the Institute of Technology, those engaged in design, analysis or research of aerospace

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the design is enclosed. From more of military research into the reliability of design to the flying performance. The basic conclusion drawn from this research can be stated very simply. If a flight can meet present system demands, it must be removed from flying status while on the ground.

PROBLEMS CAUSE

The lead determines that the probable cause of the accident was a navigation omission which resulted in a lateral collision that was not detected and corrected through passenger instrument flying procedures.

A contributing factor to the accident was low level precipitation of the weather resulting from severe storms.

In the Civil Aviation Board Report, Jerry L. Morris, Captain; Carl G. Green, Master C. James Winters, Member, Weather Committee, Virginia

Margie Vice Chairman did not rule part in the adoption of the report.

SUPPLEMENTAL DATA

The Civil Aviation Board is satisfied of the accuracy of the information presented in this report, and recommends that it be made available to Congress, and particularly to the Senate Armed Services Committee and the Senate Select Committee on Small Business, and that the report be made available to the Federal Aviation Agency. A public hearing will be held in connection with the investigation at Charlotte, N.C., Aug. 18, 1969.

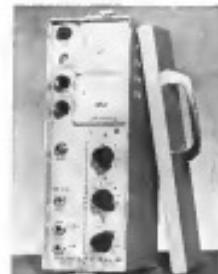
President Arthur of the Arctic Division of Precision Avionics Inc., the company incorporated in North Carolina, and in whose name the aircraft was registered, The Precision Avions Division of the company was established in 1947. It operates

under a currently effective certificate of public convenience and necessity issued to the company by the Civil Aviation Board and an air carrier operating certificate issued by the Federal Aviation Agency authorizing it to conduct air services in person, property, and mail and other services, including the one involved in the accident.

Captain George Lawrence, age 32, was serving in Precision Avions Jan. 21, 1963. He had completed the initial pilot's license and classified in the Arctic Division Nov. 24, 1958. He was promoted to senior captain on May 3, 1957. Captain Lawrence held a valid PAA pilot's license with a DC-3 rating. His total flying time was 2,000 hours, of which 1,950 were in DC-3 aircraft. His last class rating was also accomplished Oct. 13, 1959. His last instrument proficiency flight check was satisfactorily accomplished May 26, 1959.

Pilot Officer Robert S. Hall, age 25, was serving in Precision Avions Feb. 2, 1967. He held a valid PAA commercial pilot certificate with no instrument rating. According to company records he had accumulated 2,038 hrs. of which 1,978 were in DC-3 aircraft. His last flight check was satisfactorily accomplished May 13, 1967.

Capt. A. N. Hix, was manufactured from June 2, 1954, and received by Precision Avions on Jan. 14, 1955. It had been flown a total of 26,180 hrs. The aircraft had been flown 13,180 hrs. by Capt. Hix. The aircraft was a Pratt & Whitney model R-1830-82, equipped with Herkules Standard weight 2300 lb propellers.



Data Pulse Unit

High-speed data pulse measuring set Model DPMS-2, manufactured by Atlantic Research Corp., Alexandria, Va., measures pulse data signals and presents data in two modes. The set can be arranged to be one of 999 different speeds from 400 through 2,625 bits/sec. It will indicate peak detection monitored, or it can be arranged to follow changes in the steady state of level detection. Resolution is 41 ns width by 12 ps height by 14 ns depth.

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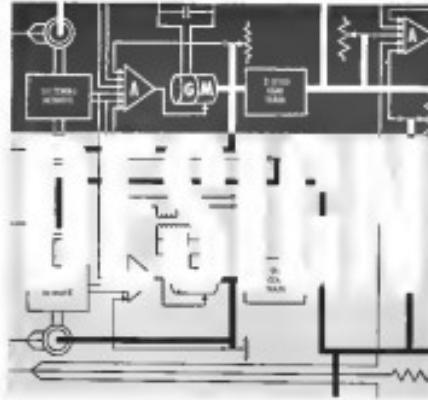
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WHO'S WHERE

(Continued from page 23)

Honors and Elections

D. R. Hudson, director of maintenance and control at the Southern Airways, Inc., has been elected 1962 chairman of the transportation committee of the Air Traffic Conference of America, a division of the Air Transport Association of America, succeeding **Milton E. Phipps**, director of transportation for United Airlines. **Ron Poffen**, director of research and development, Vought-Wright Systems, was elected vice-chairman.

Christopher S. Cockrell, manager of the research and a director of Hawker-Dickson Development Ltd., has been presented with the *Von Kármán* prize for 1960 by the Workshop of the Royal Society of London. The award is made annually for the most notable studies in transport improvement.

Changes

Robert N. Lomnick, director of marketing operations, Western Development Laboratories of Philco Corp., Palo Alto, Calif.

Donald B. Kirsch, manager of aerospace electronic marketing department, Wabash Electronics Division, Reliance Electronic Systems, a division of Wabash Electronics Products Inc., Wabash, Ind.

Alfred C. Evans, director of research and development, Weston Instruments Division of Drexel, Inc., Newark, N.J.

Bernard Molenkamp Division of The Bell Telephone Laboratories, Inc., has concluded the following program for the development and production of Telenet and Tymnet systems: **J. F. Field**, director of programs; **E. F. Lapins**, Tymnet program manager; **T. S. Toman**, Telenet program manager; **F. A. Root**, contracts manager; **D. A. Turtur**, estimating manager.

Louis D. Ziebel, manager of systems program, McDonnell Astronautics Center, Mc Donnell Aircraft Corp., St. Louis, Mo.

T. M. Hock, director of manufacturing Board Box Division of American Radio Corp., Stamford, Conn., and **C. J. Robbie**, director of quality control.

De Anselmo T. Nardozzi, head of the Technical Services Department, General Motors Defense Systems Division, Santa Barbara, Calif.

N. V. Wilson, general manager, Western Electric Group's Air Force Division, Baltimore, Md.

Harvey C. Goldfarb, Jr., managing director planning and production, Technical Products Operation of General Electric Co.'s Defense Electronics Division, Schenectady, N.Y.

G. C. Walker, director of technical support, Transocean International Corp., Wichita, Kansas.

William D. Hogan, manager of engineering systems, Remington-Rand Div., San Jose Electro Products Inc., Watsonville, Calif.

George E. Chaitin, manager research and development, Marconi Manufacturing Co., B. P. Marconi, Inc., New York, N.Y.

Don E. St. John, director of advanced developmental communication and data systems, **Yantis Corp.**, Los Angeles, Calif.

Minor Vezzani, chief engineer, **Transocean Equipment Corp.**, Cincinnati, N.Y.

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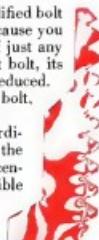
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